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ORIGINAL ARTICLES.

THE INFLUENCE OF PASTEUR ON MEDICAL SCIENCE.*

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TO ONE who treasures memories of student days spent in your pathological laboratory, when each member of a small and favored group worked under the personal guidance of the great teacher whose unselfish labors have done so much for science in this country, it is indeed an exceptional privilege to address those who represent the School of Medicine that has grown since then to be the model for many an older institution. Yet I am conscious that this very privilege entails a risk proportioned to the largeness of the opportunity of using unworthily the precious moments which fortune has bestowed on me. My choice of subject has not, I fear, lessened this hazard, for I have chosen to speak to you of one of the most significant men of the past century, whether we consider him as a person, as an investigator or as a public benefactor. I pray you, therefore, deal gently with the shortcomings of an undertaking so difficult and ambitious as that of estimating the influence of a great career on the advance of medical science.

Louis Pasteur first saw the light of day on December 27, 1822, in an humble dwelling in the little town of Dôle in the Franche Comté. His parents had small means and limited social opportunities, but through the exercise of forceful character and unusual fidelity to elevated ideals of life, managed to give him a fair elementary education. The father, earnest, industrious and intellectually ambitous, instilled into his son the desire to become a useful and respected member of society, shielded him by constant companionship from the vulgar temptations of youth and fired him with a love of country which a long and honorable career as a soldier of Napoleon had strongly fortified. The mother of young Pasteur was prevented by household cares from sharing closely the intellectual interests of her only son, but showed the depth of her affection by making many a little sacrifice to further his education. She was a spirited woman, possessed of lively imagination and quick intelligence, and it is reasonably clear that the unusual artistic preceptions of Pasteur mark the perpetuation of these maternal gifts. Although the school days of Pasteur appear to have given little indication of an exceptional future, the lad showed some qualities which distinguished his work in later life. In his daily tasks, at which he worked faithfully and deliberately, he showed the most scrupulous accuracy and truthfulness, attributes which are the more noteworthy for the reason that they belong to a temperament enriched with a strong vein of romanticism, which for a time found expression in a fervid devotion to poetic literature. Moreover, Pasteur showed while still in his teens a pronounced capacity for portraiture. During his three years of instruction at the Collège Royal of Besançon, which he entered at eighteen years of age, the young student was more absorbed in literature and art than in science, and impressed his colleagues as being surely destined for an artistic career. The courtesy of Mr. Philip B. Marcou, of Cambridge, has made it possible for me to examine closely two fine examples of Pasteur's work at the end of this Besançon period. Although these portraits disclose the manual hesitancy of the imperfectly trained craftsman, they bear an unmistakable air of distinction and are executed with a respect for detail which is highly remarkable. Anyone who sees these youthful works is likely to feel that eyes so sensitive to these minutest particulars of form, would be apt to see many things which others had failed to notice; and it is noteworthy that Emil Fischer, whose calm judgment is well known, has expressed his belief that Pasteur's crystallographic discoveries were facilitated by his artistic perceptions.

The years at Besançon were followed by a highly important course of study at the Ecole Normal of Paris, during which Pasteur formed the determination to devote himself to science. For the first time in his life, the gifted impressionable young man found himself under the influence of a creative scientific mind of the highest order, a mind which has left a large and permanent mark upon the history of chemistry and which could not fail powerfully to mold the plastic intelligence of Louis Pasteur. Jean Baptiste Dumas, who had already discovered the great principle of substitution, united to his genius as an investigator the charm of a finished and spirited delivery. His Sorbonne lectures fairly captivated the young student and gave definite and lasting direction to his study and fancy and, later, to his researches. Other teachers of a superior order contributed to lead Pasteur into the promising and fascinating paths of physics and chemistry. The attractive Balard, to whom bromine had first surrendered the secret of its existence, reinforced the chemical teachings of Dumas, and the admirable lectures of Delafosse aroused an enduring interest in the subtle beauty of crystalline forms. But it is to the strong intellect of Dumas that Pasteur owed his first grasp of the great principles of science and that enthusiasm for work, which made it possible to ignore the harsh and depressing material conditions that prevailed at the Ecole Normal.

*Address delivered at the opening of the Johns Hopkins Medical School, 1903.

The recognition by young Pasteur of the importance of correlation in the physical sciences is an impressive feature of his mind at this period of close association with great chemical investigators. Evidence of this recognition exists in a singularly fine letter, full of enthusiasm for science, which he wrote to his colleague, Jules Marcou, then entering on his distinguished career as a geologist.* "Before finishing your letter," says young Pasteur, "I had already regretted that your studies in chemistry were incapable of responding to what geology will often ask of them." . . . "I know very well that many distinguished geologists have no broad conception of chemistry, but I believe this to be a great pity and I think that geology has not often enough turned to chemistry." The chemist of twenty-three summers held a point of view which was destined very soon to aid him in a memorable research.

It was in the field of crystallography that Pasteur, led by an interest in the ingenious and delicate methods of the science, first showed his exceptional capacity to observe minutely things and processes and to correlate and interpret the results of his observations. He began by carefully repeating a series of crystal measurements on tartaric acid, racemic acid and their salts, shortly before published by Provostaye. During the study of the recrystallized salts of tartaric acid he observed one very important but unobtrusive thing which the distinguished physicist had overlooked—regular evidences of hemihedral facets. All the tartrates showed a weak kind of isomorphism which is apparently forced on them by the tartaric acid group, whatever other element may exist in the compound. Guided, as he tells us, first, by the observation of Biot that tartaric acid and its compound rotate the plane of polarization, secondly by a relationship between the crystalline form of quartz and the direction of rotation, and finally by Delafosse's conception that hemihedrism depends on definite crystallographic laws, Pasteur concluded that there is a relation between the hemihedrism of the tartrates and their optical activity. An unexpected discovery soon proved this to be true in a conclusive and beautiful manner. One day in the dark library of the Ecole Normal Pasteur's eyes lighted on a remarkable paragraph from the writings of the Berlin chemist and crystallographer, Mitscherlich, relative to two different saline combinations of tartaric acid, the tartrate and the paratartrate (or racemate) of sodium and ammonium. This note stated that these two types of double salts have the same chemical composition, the same crystal form with equal angles, the same specific gravity, the same double refraction, and that in consequence of this their optical axes form the same angles. Their water solutions have the same refraction. The dissolved tartaric acid salt rotates the plane of polarization and the racemic salt is indifferent, as had been found by Biot for the whole series of salts. "But," continues Mitscherlich, "the nature and the number of atoms, their arrangement and their distance from one another are the same in both bodies." The contradiction expressed here upset all Pasteur's physico-chemical ideas and persisted for months in his mind like an interrogation point. But the day came when experience cleared up the mystery by demonstrating that there is really a difference between the tartrates and the racemates which Mitscherlich had not noticed. The former bore hemihedral facets on the right side and always rotated the plane of polarization to the right; the latter bore facets both on the right and on the left sides and did not rotate polarized light at all. Moreover it later appeared that this inactive racemic acid may be caused to crystallize in such a way that the crystal mass consists of equally numerous dextrorotary and levorotary crystals, the former possessing hemihedral facets on the right side, the latter hemihedral facets on the left side. Both kinds of crystals were isomorphous, but the isomorphism was that of two asymmetric crystals, of an object to its reflected image. The weighty and surprising discovery had been made that indifferent racemic acid crystallizes into equal quantities of ordinary dextrorotary tartaric acid and the newly observed levorotary tartaric acid.

This research on the tartrates, culminating in 1848 with the discovery of the nature of paratartaric or racemic acid, proved that Pasteur had already made himself master of the experimental method.

Three distinct practical results followed in the train of this research as a consequence of continued studies of the crystallographic problem. In the first place there came to light numerous fresh evidences of a relation between molecular constitution, crystalline form and the property of rotating the plane of polarization. It is true that Pasteur seriously entertained some ideas of a highly speculative nature regarding the operation of dissymmetry in nature, ideas which involved him in fruitless experiments; but on the other hand the tangible and positive results of his work must be recognized as forming the basis of the modern doctrine of the asymmetrical carbon atom which has so illuminated our ideas of the spatial arrangements of the atoms within the molecules of organic substance. Secondly, the research on the tartrates led Pasteur to the recognition of a series of optically inactive compounds, including inactive malic acid and inactive amylalcohol. Finally, the crystallographic researches were the bridge over which the far-seeing investigator passed on the way to lay the foundations of a new biological science, a science which has effected a veritable revolution in our conceptions of medical problems. Cagniard-Latour, Schwann and Kützing, by knowledge gained in their experiments on alcoholic fermentation held one pass to the great secret, but saw not the fields of discovery to which it might have led them. Pasteur made his way thither by a singularly trustworthy intu-

* Mr. Philip B. Marcou has permitted me to read a large number of unpublished letters written by Pasteur to his father. The letter above quoted is dated June 10, 1845, and is one of a very small number belonging to this period.

ition. Greatly impressed with the circumstance that optically active substances like the sugars, the tartrates, the malates, the citrates, the gums and the proteids seemed to be confined to the organic world and were not to be found outside the tissues of plants and animals, Pasteur made a simple yet decisive experiment. To some pure crystallized inactive ammonium paratartrate he added fermenting albuminous material. After a time the fluid was examined with the polariscope. It rotated strongly to the left. This levorotation was obviously due to the fact that the dextrorotary constituent of the paratartrate had been decomposed. An optically inactive fluid had been converted into an optically active fluid. According to Pasteur's theoretical views this striking change indicated the mediation of living matter. The activity of unorganized purely chemical ferments could not, in his judgment, explain the facts; microorganic life must be in some way concerned. Fortunately the mind in which this conception was born was also capable of testing its correctness by the most rigid methods of investigation. Fortunately, too, the external conditions favored a studious excursion into the processes of fermentation, for Pasteur was called in 1854 to a Professorship at Lille in a region of distilleries which involved the training of young men to proficiency in industrial chemistry and made it essential to get new light upon the various kinds of fermentation.

At this period of Pasteur's career the prevalent doctrines of fermentation were singularly unsatisfactory and uncontrolled by searching experimentation. The versatile Spallanzani had nearly a century before taken the important step of showing that putrescible liquids can be permanently protected from the processes of fermentation and decomposition by boiling and exclusion of air. Then Gay-Lussac, inspired by the revolutionary but constructive work of Lavoisier made his clever attempt to show that the results of Spallanzani were due to the exclusion of the oxygen of the air from the decomposible materials, and the ingenious French cook Appert put this erroneous idea to important practical use in his widely employed method of canning perishable foods.

Thus in the early days of the nineteenth century people were content to think of alcoholic fermentation as purely a chemical process. The first great blow to this widely accepted doctrine came from Theodore Schwann's incisive studies of the yeast plant in its relation to alcoholic fermentation. Very clearly did Schwann show that oxygen does not suffice to initiate the fermentation of sugar and that the necessary condition is the presence of something which is destroyed by heat—a living organism. Unfortunately he failed to maintain aggressively the new doctrine of the dependence of fermentation on micro-organic life. The result was that the new vitalistic hypothesis failed to make any important advance in the face of the sharp criticism and ridicule of so active and influential a teacher as Justus Liebig, whose word was nearly everywhere received as final in matters chemical and physiological.

To Liebig and to many others it seemed a retrograde step to assume that a living organism like the yeast plant is the cause of alcoholic fermentation, for the most advanced scientific thinkers were eagerly striving to explain the phenomena of life by physical and chemical laws and the rôle of "vital force" was being successfully restricted almost from day to day. Liebig pointed effectively to the fact that sugar undergoes other kinds of fermentation than alcoholic, such as lactic and butyric, but that nothing like a yeast organism was to be seen in these allied types of decomposition. It seemed to him that these various kinds of decomposition had one feature in common, the presence of a small quantity of nitrogenous substance. This dead material operated as the real ferment, by communicating a kind of shock to the molecules of sugar or beef extract with which it came in contact, which resulted in the fragmentation of the molecule into smaller molecules, the essence of fermentation and putrefaction.

To Pasteur the position of Liebig was wholly unintelligible because it rested on prejudice much more than on experimental evidence. He resolved to investigate the subject of fermentations from the standpoint which he had reached by observing the fermentation of the paratartrates —that is to say with the preconceived idea that fermentation depends on the mediation of living organisms. The first notable paper in the long series which solved one of the most pressing questions in biology deals with lactic acid fermentation.* It might perhaps have been anticipated that Pasteur's first important utterance on the nature of fermentation would deal with the alcoholic form which has so great a commercial importance. He discovered, however, in lactic fermentation an admirable field on which to contest the ideas of Liebig and his followers, who were constantly pointing out that in lactic fermentation, so like the alcoholic form, there is nothing at all like a yeast ferment. This research ended, as is well known, in the discovery of a specific lactic acid organism or ferment, and in the cultivation of this and other organisms in an artificial medium free from albuminoids. Pasteur was not slow in forming the hypothesis that different types of fermentation are dependent on different types of micro-organisms and this idea of specificity, soon established in relation to the ordinary de-

*During the years 1858 and 1859 Pasteur did highly important work on alcoholic fermentation. His views as to the significance of molecular dissymmetry had already led him to regard the levorotary action of amylalcohol as an indication that this regular product of alcoholic fermentation is found by the mediation of living organisms. It was in fact his study of amylalcohol (1855) together with the experiment on inactive ammonium paratartrate that incited Pasteur to undertake researches on the method of fermentative processes. His superior chemical training under Dumas was used to great advantage in all the researches on fermentation. In the case of alcoholic fermentation Pasteur showed that the acid formed is neither acetic nor lactic acid but that succenic acid and glycerine are regular and not unimportant products. Lavoisier and Gay-Lussac represented the sugar in alcoholic fermentations as splitting wholly into alcohol and carbon dioxide, the work of Pasteur showed that five or six per cent. of the sugar is not decomposed in this way.

compositions, ultimately became the basis of our modern knowledge of the infectious diseases.

The research on lactic acid fermentation thus gave the *coup de grâce* to the chemical theory of fermentation at the same time that it marked the birth of the promising science of bacteriology. The development of a method designed to secure pure cultures from fluid media, the use of culture media of known composition and the careful chemical study of products of decomposition, all belong to this early period of Pasteur's life and were achievements of the deepest significance for the future of the great department of knowledge which has revivified the biological sciences.

Another research on fermentation deserves more than passing notice on account of the extraordinary discovery which appears as its almost acidental by-product. This is the investigation on butyric acid ferments (1861). This research brought to light the fact that there are motile organisms capable of inducing a decomposition of sugar with the production of butyric acid. In the course of this research Pasteur saw that these organisms (whose motility was most puzzling on account of its suggesting animal life) behaved very differently according to their position with reference to the cover glass, those at the center being active, while those at the periphery and exposed to the air were checked in their movements.* From this casual observation came the fundamental conception of anaerobic life. All physiologists recognize to-day "A class of beings possessing such vigorous respiratory power," as Pasteur aptly says, "that they are able to live without the influence of the air by taking oxygen from certain compounds, thus occasioning in the latter a slow and progressive decomposition."

That Pasteur's original and searching examination of the problem of fermentation would one day lead him into a controversy over the unsettled question of spontaneous generation might almost have been predicted. The long discussion with Pouchet and Bastian, containing something of bitterness and not a little of the ridiculous, is a dramatic and animated chapter in the life of a peaceable but truth-loving man. As students of the influence of Pasteur on medical science we need not pause to review this controversy, for its fruits are to be found in all his subsequent work on the specific nature of the infectious diseases. Yet this discussion, prolonged over nearly twenty years, and replete with instruction and entertainment, is worthy of a permanent place in the memories of scientific men.

After a public victory over Pouchet in 1862, which brought in its train the honor of election to the Academy of Sciences, Pasteur turned his attention toward two subjects of much practical interest which seemed closely connected with the phenomena of fermentation. One of these was the manufacture of vinegar, the other the diseases of wine. The study of vinegar led to the recognition of the micro-organic nature of the vinegar film or mycoderma and brought acetic fermentation into line with lactic and butyric fermentations. It led also to the discovery that the oxidation of alcohol through the agency of the vinegar organisms may be carried too far, acetic acid being lost by oxidation to water and carbon dioxide. Then again Pasteur was able to aid the makers of vinegar by teaching them that the indispensable film formation can be facilitated by the actual transfer of the living ferment to the surface of the vinegar. In the study of the diseases of wine Pasteur achieved even more helpful practical results, for after recognizing the dependence of sour, bitter and muddy wines on the presence of definite types of living ferments, he was able to suggest a simple and efficient way of controlling these disturbing agencies by the use of moderate heat. From this recommendation has sprung the use of the widely employed method of sterilizing which we call Pasteurization.

In Pasteur's growing interest in these works of practical utility we can detect a tendency which was destined to bear rich fruitage in medical science—the inclination to employ the gifts of which he could no longer fail to be conscious in a manner likely to be directly helpful in relieving the needs of his fellow men. It was this attitude which made it possible in 1865 to lead Pasteur not without regret away from his studies of fermentation, to a wholly new sphere of endeavor. In that year the mortality among the silkworms of northern France was so great that the silkworm industry was threatened with total extinction and grievous famine was making its appearance in a land where comfort and contentment had long reigned. Dumas, acting for a senate committee, selected Pasteur to solve the mystery of the plague. To Pasteur's remonstrance that he knew nothing of the subject and had never seen a silkworm, Dumas answered, "So much the better, you will not have any ideas except those that come to you through your own observations." There were many unfriendly comments on this appointment, for some scientific men could not understand why a chemist should be chosen to cope with an obscure zoological problem. But Dumas knew his man and confidently relied on the great gifts he saw in him. It was quickly evident that his faith was not misplaced. Only twenty days after his arrival at Alais, Pasteur prepared a note in which he outlined a method of breeding from the eggs of silkworms free from disease. Unlike his predecessors, he made the moth the center of the efforts to regenerate the race of silkworms. "If the butterfly is sick reject all its eggs." It required five years of Pasteur's most devoted attention, five years beset with uncertainties and disappointments, to establish this almost clairvoyant conception on an incontestable scientific bass. At the end of this period Pasteur and his highly skilled assistants had shown that there were two distinct diseases from which the silkworms died, pébrine or corpuscle disease, and flâcherie, a bacterial affection of intestinal origin. The former was

*Pasteur fell into the error of describing the butyric acid organisms as infusorians and thought he had shown that animal life can exist without oxygen.

proved to be a specific disease due to the psorosperm *Nosema bombycis;* the latter was believed by Pasteur to depend on a specific bacterium, but can probably be excited by several distinct varieties of bacteria. The pébrine disease, which was the chief scourge of the industry, was eradicated through the use of a careful system of breeding from eggs shown by microscopical examination, to be free from infection. The immense practical importance of this method sociologically as well as financially can be better left to the fancy than expressed in dollars and cents. But these immediate practical results do not adequately express the far-reaching effects of the great silkworm research which marks the entry of Pasteur into the realm of animal pathology, and is thus the vestibule of modern medicine. For it is true that the laws governing the propagation and development of the flâcherie disease have the most striking analogies to those of the diseases of man. The varying susceptibilities of different individuals to the same micro-organisms, the influence of the path of infection and the fact that flâcherie organisms acquire increased virulence after passage through the bodies of living silkworms foreshadow discoveries in human pathology. The two volumes dealing with the diseases of silkworms and dated 1870 are works whose contents should be familiar to every independent student of the infectious diseases.

The researches on the silkworm diseases had one practical effect of considerable importance for Pasteur's later career. The success with which Pasteur had solved his intricate and widely known problem made it natural that French investigators of animal pathology should in future turn to him as the man most likely to help them in their work, and this brought to him new opportunities for fresh successes.

It is likely that excessive work and mental stress in some degree contributed to the onset of the series of paralytic seizures which in October, 1868, threatened the life of Louis Pasteur. During the critical period of his illness many of the most distinguished scientific men of France vied with each other to share with Mme. Pasteur the privilege of nursing the man they loved so well, and of rescuing the life that had already placed science and a nation under enduring obligation, through discoveries which were either of the greatest practical utility or appeared susceptible of almost unlimited development. Had Pasteur died in 1868 he would have left a name immortal in the annals of science. Others would in some degree have developed his ideas. Already inspired by the researches of fermentation, Lister would have continued to develop those life-saving surgical methods which will forever be associated with his name. But we may well question whether investigations in biology and medicine would not have been, for a time at least, conducted along less fruitful paths. Who shall say how soon the great principle of experimental immunity to pathogenic bacteria, the central jewel in the diadem of Pasteur's achievements, would have been brought to light?

When Pasteur recovered sufficiently to resume work it was soon clear to apprehensive friends that he had no intention of leaving his ideas to be worked out by other men. The miseries of the Franco-Prussian war deeply affected him, and could not fail to inhibit his productiveness, but after a time the unquenchable love for experimental research was once more ascendant, and there began a new epoch, the epoch of great discoveries relating to the origin and cure or prevention of the infectious diseases of man and the domestic animal. As in the case of Ignatius Loyola, it seems as if the lamp of genius shone with a larger and more luminous flame after the onset of bodily infirmity, in defiance of the physical mechanism which is too often permitted to master the will.

The hostility of Pasteur to Germany and all things Teutonic was greatly intensified by the events of the Franco-Prussian war and has left a somewhat regrettable impression on his scientific work. Desiring to contribute to the rehabilitation of his unhappy country he was led to improve the processes of brewing, with a view to increasing the wealth of France and at the same time lessening the yearly tribute to the despised people beyond the Rhine. It was easily shown that some of the diseases of beer are due to the action of bacteria allowed to take part in the process of fermentation. But it soon became clear that the mere exclusion of these micro-organisms does not insure a brew of good beer. The problem was considerably complicated by the difficulty of deciding what constitutes excellence in beer and this situation was not helped by the fact that Pasteur who disliked the German drink almost as much as he disliked Germans, could not distinguish one brew from another. Nevertheless, after many discouragements he succeeded in establishing methods which much improved the character of French beers, methods involving the aeration of beerwort by sterilized air and the abandonment of open coolers. The results were far from satisfactory owing to the circumstance that Pasteur quite overlooked the part played by the undesirable forms of yeast—so-called wild yeasts—in the production of abnormal fermentations. In fact it is doubtful if he could have separated the different types of yeast by the methods at his command, for even in so late a work as the famous "Etudes sur la Bière," bearing the date 1876, we are struck with the inadequate character of Pasteur's devices for obtaining pure cultures of micro-organisms.

This work with its tender dedication to the memory of Pasteur's father, was a highly important contribution to bacteriology in spite of its many botanical defects. It is really a bacteriological potpourri bringing together the writer's views on many questions, rather than a strict treatise on the diseases of beer. Besides chapters on the causes of bad beer and our improved methods of brewing, the volume treats of the origin of fer-

ments and furnishes conclusive experimental evidence against that plastic doctrine of the transformation of species around which the friends of the spontaneous generation fallacy were hopefully rallying. But by far the most striking and original chapter in this notable volume is that in which Pasteur formulated his physiological theory of fermentation—the startling theory that the essential characteristic of fermentation is life without air, life without free oxygen. This theory, if not entirely upheld by other biologists, has at least proved a powerful stimulus to new studies of this unexplored aspect of life.

Pasteur's life was prolonged a quarter of a century after the close of the war with Germany and during a large part of this long period his mind dwelt almost unceasingly on two phases of the great biological and practical problem which it was his fortune to develope so fruitfully. One of these was the investigation of the etiology of disease as related to the activity of micro-organisms. The other was the experimental study of the amazing phenomena of immunity to the action of specific viruses or virulent micro-organisms. These two interdependent phases of bacteriological research culminated in one of the most remarkable discoveries of all time, remarkable for its practical results but even more striking as an example of the use of the imagination in science. It is well worth while to consider the chief events that ultimately led to the discovery of a method of immunization against the virus of hydrophobia.

The idea that some diseases are due to living micro-organisms was suggested by Boyle two hundred years before the days of bacteriology. From time to time thoughtful men took up this idea as worthy of discussion but it received no substantial confirmation until Schoenlein, with the aid of the microscope made his admirable discovery of the infectious nature of ringworm. This was in 1839. Within a few years Henle, the gifted anatomist of Göttingen, proposed an ingenious explanation of the infectious diseases which assumed the agency of micro-organisms, but the theory though based on thoughtful clinical considerations was deficient in experimental data and had little practical influence on medicine. It is scarcely surprising that the leading scientific minds of the epoch should have been hostile to any mere hypothesis of contagion by germs, for in their struggle against the ancient conception of a vital force they regarded the idea of a *contagium vivum* exactly as Liebig had regarded Schwann's and Pasteur's doctrine of fermentation. Even the illuminating cell doctrine of Virchow was not especially favorable to the idea that living organisms from outside can excite disease by fixing themselves and developing in the body. Pasteur's training and temperament and genius admirably fitted him not merely to detect the great central truth of etiology but to force it, in spite of stubborn opposition, upon a doubting world half stunned at the boldness of the new doctrine. But while he took by far the larger part in compelling this revolution in the conception of disease the way was prepared by others, and especially by the fine observations of the biologist Casimir Joseph Davaine and the accurate and ingenious experimental methods of Robert Koch.

Davaine, while assisting the clinician Rayer in the study of the devastating anthrax plague in 1850 observed little thread-like bodies in the blood of animals dead of this disease. Ten years later Delafond observed these little threads to be living organisms with the power of multiplying outside the body. Thirteen years after his first observations Davaine, incited by Pasteur's suggestive work on the butyric acid ferment, reopened his study of anthrax and confidently proclaimed that the organisms he had found were the cause and the only cause of anthrax. But it required the superior technic of Koch unquestionably to obtain the anthrax organisms in pure culture, to follow the cycle of their development in the animal body and thus to place the important discovery of Davaine on an impregnable scientific foundation. Pasteur, entering this field a little later, independently worked out some of the most striking features of the etiology of anthrax and convinced the best scientific minds of France of the relationship between the bacilli of Davaine and the perpetuation of the anthrax plague.

Very closely associated with Pasteur's work on anthrax is the admirable research in which the master, aided by Joubert and Chamberland, discovered the organism known to us as the bacillus of malignant edema but described by its detectors as the *Vibrio septique* in the same year (1877) in which the widely known publication on anthrax appeared. Of the many excellent features for which this research is distinguished there are two that deserve especial mention. First, the recognition of the *Vibrio septique* in the blood of animals not newly dead of anthrax was an extremely important service in clearing up the gravest objections to Davaine's doctrine of the etiology of anthrax. Secondly, the observation that the septic vibrio is anaerobic affords the earliest example of a pathogenic organism which in its vegetative form is inhibited by the presence of oxygen—a discovery which we may reasonably attribute to the experience gained sixteen years before with the butyric ferment.

In looking for fresh proofs of the bacterial origin of disease Pasteur made some visits to the hospitals of Paris and thus came into closer relations with the practitioners of medicine and surgery. The alert and intellectually honest minds bade him welcome and gave him every help to pursue his studies; the conservatives looked at him askance, confidently set up their time-worn theories against his experimental proofs and lost no occasion to ridicule the germ theory of the origin of disease. To-day it is difficult for us to picture the incredulity and amazement of many prosperous and self-satisfied practitioners on hearing Pasteur's announcement that he had found the same pus exciting micro-organisms (probably the *Staphylococcus pyogenes aureus*) in the pus from a series of boils and in the pus from osteo-

myelitis, and that these conditions, so different in clinical characters are identical as regards etiology. Very soon a second bomb of the same nature fell into the conservative camp with the confident and even fervid declaration that childbed fever is a septicemia commonly due to a coccus (streptococcus)* which could be detected in the cavity of the uterus, in the blood of the uterine sinuses, and in the blood of living patients. The far-reaching practical results of this investigation, to which Pasteur devoted only one short publication, are so well known to you that they call for no comment here.

Not long after the beginning of the anthrax study the attention of Pasteur was directed to a disease which was destined to play a remarkable part in leading to the great goal toward which the researches of the master were carrying him—the discovery that it is possible experimentally to induce immunity to disease caused by virulent micro-organisms. Perroncito, of Turin, and Toussaint, of Toulouse, had reached the conclusion that an organism detected by the former is the cause of chicken cholera, but neither had the requisite bacteriological training actually to establish the correctness of this contention. Pasteur was consulted on the subject, and, bringing to bear his superior knowledge and technical skill, succeeded in growing the organism outside the animal body and in experimentally inducing chicken cholera by means of these cultures grown *in vitro*. Returning to the laboratory after a short absence he found that his cultures of the bacilli of chicken cholera had failed to grow or had grown only feebly. To increase the activity of these micro-organisms they were now inoculated into normal fowls—a procedure suggested by previous experiments with other bacteria. The results were disappointing, for the inoculated animals showed no signs of the disease. This made it necessary to isolate and grow actively pathogenic bacteria from animals with chicken cholera. Having done this it occurred to Pasteur that it would be of interest to inoculate with fresh and virulent bacilli the animals already treated with the attenuated strain of chicken cholera organisms. This was done without delay, and, to his surprise, nearly all of these prepared animals resisted the virulent germs. They had been immunized by means of the attenuated cultures and a new principle had come into medicine. By experimental study and long reflection on the work of Jenner, the mind of Pasteur had been prepared to grasp the immense practical significance of this discovery. It appeared probable that what had been accomplished for chicken cholera could be extended to other diseases. One special consideration made Pasteur feel hopeful as to the possibility of immunizing sheep and cattle against anthrax. He had noticed that certain sheep long exposed to anthrax through grazing on infected pastures did not die after experimental inoculation with a virulent anthrax culture, whereas previously unexposed animals of the same herd died promptly after such inoculation. Moreover, he knew from experience that fowls can be immunized against chicken cholera by feeding them the specific germs of that disease and this fact strongly suggested a similar explanation for the anthrax immunity which he had noticed. With that analogy in mind Pasteur took the first step toward the preparation of a vaccine against anthrax. As in the case of chicken cholera, he strove to attenuate the specific organisms of the disease. This he tried to do in the way that had succeeded so well in the case of chicken cholera, this is by exposing anthrax cultures to an abundance of oxygen at the body temperatures. But Pasteur found that under these conditions the anthrax organisms retain their virulence, owing, he believed, to their capacity to produce resistant spores. To check this growth of the anthrax spores he successfully resorted to the procedure of growing his cultures at a temperature of 42° to 43° C. in the presence of oxygen. By varying the procedure somewhat he was able to prepare a series of anthrax vaccines of different degrees of activity, the use of a mild vaccine being followed by that of a stronger one in the course of immunization.

The announcement by Pasteur, Chamberland and Roux of a method of protecting animals against the anthrax scourge excited great public interest but was in many quarters received with skepticism and derision. Pasteur was invited to make a large scale public test of his claims near Melun at the farm of Pouilly le Port. He accepted the challenge gladly and on May 5, 1881, began a series of public inoculations which will always be memorable in the annals of medical science. The publicity with which the unique experiment was performed; the unconcealed hostility and suspicion of many of the onlookers, and the alternating hopes and fears of Pasteur, have been most entertainingly described by M. Vallery-Radot. The outcome was a convincing demonstration of the practicability of Pasteur's method of immunizing against anthrax in sheep. Nevertheless, two years later, in an ill-natured attack on Pasteur's work, Koch attributed the discovery of vaccination against anthrax to Toussaint and pointed to a paper in which the latter had reported some experiments describing the immunization of dogs and sheep by means of anthrax bacilli which had been heated at 55° C. for ten minutes.

While it is true that Toussaint thus immunized animals against virulent anthrax organisms, his method of obtaining a vaccine was unreliable and unsuited for practical use. The fact is that Toussaint, stimulated by Pasteur's discovery of a method for immunizing against chicken cholera, prepared a vaccine which sometimes protected against the disease but which was dangerous owing to uncertainty as to the number and condition of the living anthrax organisms which it contained. His publication appeared six months after

*Pasteur's description of the organism found in puerperal septicemia is not full enough to make it certain that he was dealing with pure cultures of the *Streptococcus pyogenes*.

that of Pasteur, who, although greatly interested in the observation of Toussaint, criticized the methods of the latter and ultimately prepared a safe vaccine consisting of definitely attenuated anthrax organisms. The crude experiments of Toussaint were wholly based on the epoch-making immunization to chicken cholera originated by Pasteur.

On March 15, 1882, Louis Thuillier, the earnest and gifted but ill-fated young assistant of Pasteur, discovered in the blood of swine dead of erysipelas (rouget de porc) an organism which appeared to be the active agent of this plague—an organism which Klein in his elaborate investigation had quite overlooked, but which was independently discovered by Detmers, of Chicago. Pasteur had inspired this fine research of Thuillier and stood ready to develop it. By carrying the suspected organism through many generations on veal bouillon and finally introducing it into hogs, the true swine erysipelas was readily induced. The real problem, however, was to make an attenuated virus for the purpose of immunizing against the disease. Pasteur succeeded in obtaining a virus capable of protecting certain races of hogs for a period of a year or more and this important practical success is rendered especially noteworthy by the method that was followed in attenuating the rouget organisms. In 1887 he had found in the saliva of rabid dogs an organism highly virulent for rabbits, (micrococcus of rabbit septicemia).* Adult guinea-pigs were immune but young guinea-pigs quickly died after inoculation. By passing the organism through a series of young guinea-pigs it gained in virulence until it grew fatal for adult guinea-pigs. But the modification which especially impressed Pasteur was that the bacteria which had thus gained in pathogenic qualities for guinea-pigs had at the same time become attenuated for rabbits.

The memory of this singular observation now came to his aid in the rouget research. After passing the rouget bacteria through a series of pigeons (which are naturally susceptible) it was found that the blood from the last pigeon had become much more pathogenic for swine than blood from hogs dead of swine erysipelas. On the other hand, Pasteur discovered that while the passage of the rouget organisms through a series of rabbits (which are not naturally susceptible) permitted these bacteria to grow more readily in the blood of rabbits and to become more highly pathogenic for them, they became definitely and permanently diminished in virulence for swine. Thus after inoculation with modified organisms hogs became ill but did not die. On their recovery they were immune to fatal rouget. The genius of Pasteur thus gave to biological science a definite method of permanently modifying the pathogenic characters of certain micro-organisms. This contribution is recorded in a paper which won the applause of the Academy of Medicine and which even to-day excites admiration for its mingling of experimental skill and scientific imagination.

So far back as 1880, in the midst of the exacting anthrax investigation, Pasteur had found time to begin a new research on the protective action of attenuated virus. From modest beginnings this research grew in the hands of the master to be the crowning work of his life, in the sense of embodying the fullest and in some respects most original expression of his ideas on the use of experimentally enfeebled viruses for the mitigation of infectious processes. The transmission of rabies through bites made probable the infectious nature of the disease and encouraged a hope that it would not be very difficult to isolate the specific organism from the saliva of rabid dogs. But the most systematic efforts to isolate such an agent were rewarded only by failure. To this disappointment was added a second, even more disconcerting. It was found that the experimental transmission of the disease by means of saliva is a matter of great uncertainty. Moreover the uniformly fatal outcome of hydrophobia made it impossible to form any opinion as to whether the unknown virus was capable of conferring immunity. Many an investigator would have been deterred from the prosecution of an enterprise so unpromising, but the interest of Pasteur had been fully enlisted before he realized the difficulties of the problem, and the tenacity of his nature urged him to keep patiently on his course. He saw clearly that a reliable way must be found to communicate rabies experimentally and acting on a suggestion made by Dr. Dubu, of Pau, that the disease is essentially one of the central nervous system, Pasteur took small bits of nervous tissue from animals dead of rabies and placed them under the skin of experimental animals. This method was no considerable improvement on similar inoculations of saliva from rabid dogs, but it served as the clew to a notable advance. This was the introduction of rabic nerve-tissue directly into the central nervous system of the animal to be infected, a procedure based on the idea that since rabies behave like a disease of the nervous system the micro-organisms causing it would be likely to find in the nervous system a living culture medium highly favorable to their growth. The acute intelligence of the masterful experimentalist is strikingly illustrated by the fact that failure to isolate specific micro-organisms had not shaken his faith in the trustworthiness of his preconceived idea. Hence when he found that hydrophobia regularly followed subdural inoculation with rabic nervous material he was more pleased than surprised. The first dog thus inoculated showed unmistakable signs of rabies after fourteen days and other animals gave similar results. Moreover, on bringing into practice the experience he had gained in studying swine erysipelas, Pasteur found that he could increase the pathogenic properties of the virus by carrying it subdurally through a series of rabbits or reduce it for dogs by carrying it subdurally through a series of monkeys. He thus had at his command three different viruses, a

*Micrococcus lanceolatus.

virus of natural strength, a virus of increased virulence and an attenuated virus. Later experiments showed that a safer virus could be prepared by drying over caustic potash at 21° C. spinal cords of rabbits dead of rabies.

By injecting subcutaneously first a weak virus and subsequently a stronger one into parts with very few nervous structures Pasteur succeeded in immunizing dogs against otherwise fatal subdural inoculations. This success suggested the possibility of immunizing human beings. The relatively long duration of the period of incubation, which is commonly about forty days, made the outlook for human immunization peculiarly promising. The opportunity for trying the method soon appeared in the person of the little Alsatian lad, Joseph Meister, who came to Paris with fourteen wounds inflicted by a rabid dog. Pasteur courageously resolved to make an effort to rescue the bitten child from the certain death to which he was doomed, by making successive injections of rabbit viruses of increasing strength. The result is known to all the world; the effort to utilize the long period of incubation to quickly establish immunity through repeated inoculations, proved a success, not only in the case of little Meister, but in many thousand other instances.

The great research on rabies fittingly marks the culmination of Pasteur's long career as an investigator. In that investigation can be seen the same technical skill, the same respect for minute detail and the same pertinacity that had distinguished so many earlier researches, but there can be seen also a degree of originality and a fertility of resource that excel nearly all previous exhibitions of these powers. The accumulated experience of a quarter century of original study of micro-organic life served as intellectual capital on which Pasteur drew for guidance at every turn in the extraordinarily intricate and perplexing study of rabies. And it seems wholly clear that this new discovery could never have been made without such a treasure of experimental experience.

One who looks only at the results of Pasteur's far-reaching work is apt to overlook his mistakes and shortcomings and to forget that he made some serious errors not only in the interpretation of experimental data but sometimes also in experimental technic. To pathologists of the present day Pasteur's conception of acquired immunity appears so crude that it is difficult to believe he ever entertained it seriously. His work on chicken cholera naturally led him to form a theory to account for the immunization which he observed and this theory was that immunity arises from the inability of a pathogenic organism to grow in a medium in which it has previously developed. Animals thus become immune because the necessary nutrient material for the multiplication of the specific organisms has been made up, just as an organism will after a time cease to grow *in vitro* in an old culture medium. It seems strange that he did not test this theory by trying to grow the organisms outside the body in the blood and serum of both the immunized and normal animals and so learn that he was in error. The short and usually inadequate descriptions of micro-organisms which Pasteur has given in his terse publication have aroused much criticism from bacteriologists and it cannot be denied that he underrated the importance of minute morphological and cultural studies, studies without which some of the most important modern advances could not have been made. Nor is it easy to explain the reluctance with which he adopted the improved bacteriological technic of other investigators. Koch's method of plating bacteria, Weigert's and Ehrlich's methods of staining and certain important nutrient media found their way into his laboratory only after long delay and through the efforts of assistants. Pasteur's comparatively faulty technic for obtaining pure cultures of bacteria is doubtless responsible for many of the disheartening results reported by foreign observers who used his vaccines. Nevertheless his methods in the main served their purpose well, and we should remember that the most finished instruments cannot belong to the pioneer who makes his own tools. Fortunately, Pasteur was greatly favored by the circumstance that in many of his etiological studies he made cultures from the blood, where the specific micro-organisms often existed in pure culture.

Although even the plainest narrative of Pasteur's individual achievements is proof enough that his work holds a unique position in the history of biological science it is worth while to consider in more general terms what it was that the consummate experimentalist added to the science of medicine. Such a consideration gives us a more just measure of his influence than the most detailed recital of specific investigations. If we would understand the influence of Pasteur on medical science we must recognize that his example as the apostle of an almost untried method of approaching the problems of medicine has been no less enlightened than his actual discoveries. Emerson has said, "Great men exist that there may be greater men." The recent history of medicine in the United States as well as in Europe plainly shows that the seed of example sown by Pasteur has already fallen on receptive soil from which have sprung new combinations of human faculties powerful for the amelioration of human life. Our country has no greater cause for satisfaction than the knowledge that the ideality as well as the methods of Pasteur have inspired a growing circle of original investigators in medical science who labor for the common welfare. Let us hope that this circle will be continually widened, in the future as in the past, by accessions from the students of this University, where the best ideals of work have been so richly nurtured.

Perhaps the most deeply significant feature of Pasteur's contributions to medicine is their direct dependence on the principles of physics and chemistry, the sciences that so often lie at the heart of real advances in biology. Medical men

trained along the conventional semi-scholastic lines had often dabbled with these fundamental sciences and sometimes the superficial contact had yielded creditable or even important results. In many instances also truly great advances had come from the labors of men who like Malpighi, Bichat and Johannes Müller were wide awake to the fact that sound medicine must rest on sound biological conceptions.

But despite the activity of numerous gifted medical men of broad scientific sympathies the medical profession at the beginning of Pasteur's career was dully following a well trodden but nearly blind road, in the hopeless struggle to solve the intricate problems of human pathology and physiology by minute observations and experiments confined largely to the most complex representatives of animal life. Then for the first time there appeared in the biological sciences a man profoundly trained in the methods of chemistry and physics and inspired, moreover, with a firm confidence in the applicability of these sciences to the solution of biological and medical problems. Triply armed with a sound method, a lofty imagination and a strong will to serve his country, Louis Pasteur entered the wide arena of medical research, to win there the triumphs that have reconstituted medicine and have secured him an undying fame. Step by step, with rigid logic and unfaltering determination, he passed from the early crystallographic discoveries to the new conception of fermentation and from this to the crucial discoveries relative to etiology and immunity for which the medical sciences had waited so long.

To have fought the long battle of life with unwavering constancy to the loftiest ideals of conduct, toiling incessantly without a thought of selfish gain; to have remained unspoiled by success and unembittered by opposition and adversity; to have won from nature some of her most precious and covert secrets, turning them to use for the mitigation of human suffering—these are proofs of rare qualities of heart and mind. Such full success in life did Louis Pasteur attain, and from the consciousness of good achieved, his noble nature found full reward for all his labor.

Of the children whom fortune has endowed with splendid gifts, there are few whose lives have affected so profoundly and so beneficently the fate of their fellows, few who have earned in equal degree the gratitude and reverence of all civilized men. Although not many can hope to enrich science with new principles, all of us may gain from Pasteur's life the inspiration to cultivate the best that is in us. Let us keep living in our memories the inspiriting words which the master spoke on the seventieth anniversary of his birthday: "Young men, young men; devote yourselves to those sure and powerful methods of which we as yet know only the first secrets. And, I say to all of you, whatever may be your careers, never permit yourselves to be overcome by degrading and unfruitful skepticism; neither permit the hours of sadness which come upon a nation to discourage you. Live in the serene peace of your laboratories and your libraries. First ask yourselves, what have I done for my education? Then, as you advance in life, what have I done for my country? So that some day that supreme happiness may come to you, the consciousness of having contributed in some manner to the progress and welfare of humanity. But, whether our efforts in life meet with success or failure let us be able to say when we near the great goal, 'I have done what I could.'"

REPORT UPON THE RESULTS WITH DIFFERENT KINDS OF PURE AND IMPURE MILK IN INFANT FEEDING IN TENEMENT HOUSES AND INSTITUTIONS OF NEW YORK CITY: A CLINICAL AND BACTERIOLOGICAL STUDY.*

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THE work, of which the following is a report, is a part of an investigation into the production, transportation and feeding of cow's milk in New York City, which was undertaken in the summer of 1901, and which was extended over two years. The entire investigation contemplated an inquiry into the condition of farms such as were supplying milk to New York, the transportation of milk, its condition on delivery and its effect upon the children in tenement houses and institutions.

Observations upon the results of feeding cow's milk to healthy infants in tenement houses were determined upon, since in this way it was believed we could best study the problem under the conditions actually existing, and also avoid those influences met with in institutions which in themselves are so deleterious to infants. For comparison, however, a number of institutions were carefully studied during the summer of 1901.

The purpose of this investigation was to gather some facts upon the following points: (1) To make a comparison of the results of infant feeding in tenements in winter and summer; (2) to determine how far such results were affected by the character of the milk used, especially its original bacterial content, its preparation, and whether it was fed after heating or raw; (3) to see to what extent results were modified by other factors, such as the care the infants received and the surroundings in which they lived.

The clinical observations contained in this report were made by the following persons who were employed by the Rockefeller Institute: Drs. Eli Long, Mary E. Goodwin, Jane Berry, Alma Vedin, Mary Willets and Marie Grund. During the first season, J. S. Mabey was employed by the Institute, but during the second by Mr. Straus. There assisted in the work as volunteers, Drs. J.

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Sobel, Angenette Parry and Ford. Dr. Sobel reported for two seasons on a group of babies fed from the Good Samaritan Dispensary. To all of these workers the greatest credit is due for the thorough and conscientious way in which they did their work. They were most earnest and painstaking in obtaining as far as possible the facts desired, and much of the value of this report is due to their efforts. The bacteriological investigations were for the most part carried out in the Research Laboratory of the Health Department; but also, to a considerable extent, in the Carnegie Laboratory of the New York University. Drs. Letchworth Smith, Mary E. Goodwin, Katherine R. Collins and Rose A. Bebb carried out this portion of the work.

Observations were made during the summer of 1901, the winter of 1901-2, and the summer of 1902; during each of these seasons the different groups of infants were followed for an average period of about ten weeks. A considerable number were unavoidably lost sight of owing to removal with failure to leave address, and various other causes; but all others who could be kept under observation are included in the report. Excluding all imperfect records and those cases that were observed too short a time to admit of any deductions, there remain 632, of which 98 were observed during the summer of 1901; 211 in the winter of 1901-2; 278 in the summer of 1902, and 45 in the summer of 1903. This special group of 45 is included although the observations were made after the general investigation had closed.

The plan of investigation was that each of the workers should have a group of children, never more than 50, under personal observation. So far as possible the children were kept under the same general conditions as before. The weights were taken with great care by the physicians, at regular intervals in most cases. Nearly all of the infants were observed in their homes, to which regular visits were made twice a week for the entire period. One group of about 50 was observed by Dr. Sobel at the Good Samaritan Dispensary to which mothers came daily for the milk for their infants. When necessary one of his assistants went to their homes. In all cases advice was given in regard to matters of hygiene and the general care of the children. It was customary to stop the milk temporarily, whenever acute disturbances of digestion existed.

Bacteriological Investigation of the Milk Used in Feeding.—The clinical work was carried on in conjunction with a bacteriological study of the milk used, in order to determine whether any relationship existed between the number and character of the micro-organisms in milk, and the amount of diarrheal disease in the children to whom it was fed. Bacterial counts were made once or twice a week from the milk as given to each child. Specimens being taken at times from the raw and at times from the heated milk.

The bacteria were isolated from the milk through plating in a two-per-cent. lactose-litmus-nutrient-gelatin, or agar, and later grown upon the usual identification media. The pathogenic properties of the different bacteria were tested by intraperitoneal and subcutaneous inoculation in guinea pigs with 2 c.c. of a forty-eight-hour broth culture, and by feeding young kittens for several days with 3 to 6 c.c. daily of a twenty-four-hour broth culture by means of a medicine dropper.

With the characteristics of the bacteria thus determined, they were then separated into classes following as nearly as possible the lines suggested in Chester's Manual of Determinative Bacteriology. Further attempt was then made to identify as many as possible of the varieties with those previously described, using the descriptions of Chester and Migula. With a great many this proved unsatisfactory or impossible because of the incomplete descriptions in literature, or the lack of all description.

The varieties isolated represent only the species presenting greatest number in the milk examined, for in no case was more than 0.01 c.c. of a milk, and in most highly contaminated milks, only 0.001 c.c. used in making a plate, and varieties which occurred in too small numbers to be present in this quantity would necessarily be missed. For the purposes of this article it is not considered desirable to burden the reader with the enumeration of the varieties of bacteria found in the different samples of milk and their characteristics. Only a brief summary of the results will be given.

From the milks altogether 239 varieties of bacteria were isolated and studied. These 239 varieties, having some cultural or other differences, were divided into the 31 classes, each class containing from 1 to 39 more or less closely related organisms.

As to the sources of bacteria found in milk, we made sufficient experiments to satisfy us that they came chiefly from outside the udder and milk ducts.

Bacteria were isolated from various materials which under certain conditions might be sources of contamination for the milk, and the cultures compared with those taken from milk. Thus there were obtained from 20 specimens of hay and grass, 31 varieties of bacteria; from 15 specimens of feces, manure and intestinal contents, 28 varieties; from 10 specimens of feed, 17 varieties. Of these 76 varieties there were 26 which resembled closely those from milk, viz., 11 from grass or hay; 26 from manure; 5 from feed.

During the investigation a number of the varieties isolated from milk were shown to be identical with types commonly found in water.

From the few facts quoted above and from many other observations made during the course of the work, it would seem that the term "milk bacteria" assumes a condition which does not exist in fact. The expression would seem to indicate that a few varieties, especially those derived in some way from the cow, are commonly found in milk, which forms having entered the milk while still in the udder, or after its with-

drawal, are so well fitted to develop in milk that they overgrow all other varieties.

As a matter of fact, it was found that milk taken from a number of cows, in which almost no outside contamination had occurred, and plated immediately, contained, as a rule, very few bacteria, and these were streptococci, staphylococci and other varieties of bacteria not often found in milk sold in New York City; the temperature at which milk is kept being less suitable for them than for the bacteria which fall into the milk from dust, manure, etc. A number of specimens of fairly fresh market milk averaging 200,000 bacteria per c.c. were examined immediately, and again after twelve to twenty-four hours. In almost every test the three or four predominant varieties of the fresher milk remained as the predominant varieties after the period mentioned.

The above experiments seem to show that organisms which have gained a good percentage in the ordinary commercial milk at time of sale will be likely to hold the same relative place for as long a period as milk is ordinarily kept. After the bacteria pass the 10 or 20 million mark, a change occurs, since the increasing acidity inhibits the growth of some forms before it does that of others. Thus some varieties of the lactic acid bacteria can increase until the acidity is twice as great as that which inhibits the growth of streptococci. Before milk reaches the curdling point, the bacteria have usually reached over a billion to each c.c. For the most part specimens of milk from different localities showed a difference in the character of the bacteria present, in the same way that the bacteria from hay, feed, etc., varied. Even the intestinal contents of cows, the bacteriology of which might be expected to show common characteristics, contained beside the predominating colon types, other organisms which differed widely in different species and in different localities. Cleanliness in handling the milk and the temperature at which it had been kept were also found to have had a marked influence on the predominant varieties of bacteria present.

Pathogenic Properties of the Bacteria Isolated.—Intraperitoneal injection of 2 c.c. of broth or milk cultures of about 40 per cent. of the varieties tested, caused death. Cultures of most of the remainder produced no apparent deleterious effects even when injected in larger amounts. The filtrates of broth cultures of a number of varieties were tested, but only one was obtained in which poisonous products were abundantly present. Death in guinea pigs weighing 300 grams followed within fifteen minutes after an injection of 2 c.c.; 1 c.c. had little effect.

As bacteria in milk are swallowed and not injected under the skin, it seemed wise to test the effect of feeding them to very young animals. We therefore fed forty-eight hour cultures of 139 varieties of bacteria to kittens of two to ten days of age, by means of a glass tube. The kittens received 5 to 10 c.c. daily for from three to seven days. Only one culture produced illness or death. A full report on the identification of the varieties of bacteria met with in this investigation can be found in an article by Dr. Smith in the 1902 Annual Report of the Department of Health.

After two years of effort to discover some relation between special varieties of bacteria found in city milk and the health of children, the conclusion has been reached that neither through animal tests nor the isolation from the milk of sick infants have we been able to establish such a relation. Pasteurized or "sterilized" milk is rarely kept in New York longer than thirty-six hours, so that varieties of bacteria which after long standing develop in such milk did not enter into our problem. The harmlessness of cultures given to healthy young kittens does not of course prove that they would be equally harmless in infants. Even if harmless in robust infants, they might be injurious when summer heat and previous disease had lowered the resistance and the digestive power of the subjects.

This failure to discover definite pathogenic bacteria, as well as the numerous varieties of bacteria met with, have forced us to rely on the clinical observation of infants to note what difference, if any, occurred in those fed on raw and Pasteurized milk from the same source, and upon different milks of unknown origin varying in the number of bacteria contained. In the following pages, observations upon food are combined with those upon other factors which influenced the health of the infants.

Selection of the Children for Observation.—The original aim was to include only infants who were entirely bottle-fed, but it was found that the great majority of all infants in the tenements receive during the first six months occasional breast feedings at night, and nearly all are given some solid food after they are six months old, or as soon as they are able to hold it in their hands. The purpose of the investigation being to obtain relative results with different forms of milk and not absolute results with one form, it is believed that the conclusions reached are not affected by the fact that many of the infants received breast feeding at night. Indeed including such infants has the advantage of studying representatives of a very large class. In each season some infants who were entirely breast-fed were observed for purposes of comparison.

In selecting the children the only conditions made were that they should not be ill or suffering from marasmus when observations were begun, and that they should be of suitable age. Of the entire number 340 were six months old or under, 265 were from seven to twelve months; 47 were a little over twelve months. With the exceptions stated, every child available was included by the physicians until the proper number was made up. The district in which most of the children lived was the lower east side of New York, as densely populated as any part of Manhattan Island.

An unexpected difficulty was encountered in beginning the investigation in the scarcity of bottle-fed infants in the region where the families were selected. One of the physicians reported

that in a densely populated neighborhood where every street was swarming with children, hardly half a dozen bottle-fed infants could be found on a block. While this may not have been true of the entire district, it was the observation of all the workers that the proportion of bottle-fed infants in tenement houses was surprisingly small. This is a very different impression from what one gains from visiting dispensaries where great numbers of bottle-fed infants are seen. But the dispensaries draw patients from very large districts and gather the cases that are not doing well, so that the aggregate seems very large. This excess in proportion of the bottle-fed infants at the dispensaries over that in the houses is in itself striking testimony to the advantages of breast feeding.

The Character of the Food Employed.—It was at first intended to make no change in the food the child was receiving, but it was found necessary in order that observations might also be made upon the comparative effects of heated and unheated milk in summer to place a number of infants upon a modified raw milk provided for them, which was a part of a larger supply distributed to others after Pasteurization. This was rendered all the more necessary since it was discovered that during the summer the sterilization of milk in some form was almost universally practiced in the tenements of New York. In the summer of 1902 especially, it was rare to find an infant fed upon raw milk; an incidental testimony to the value of the praiseworthy efforts of the Health Department, and the agitation in the public press in favor of clean milk and the necessity for sterilization in hot weather. When gastro-intestinal disturbance of any severity developed, the infants were deprived of milk for a day or two and put on barley water or other suitable food.

In the district where the observations were made the following forms of milk were extensively used: (1) Condensed milk; (2) milk purchased at small stores with groceries and other provisions and known as "store milk;" (3) bottled milk; (4) milk from central distributing stations, chiefly from the Straus milk depots and Good Samaritan Dispensary.

Condensed Milk.—That used was usually bought in cans, *i.e.*, the sweetened variety; seldom were the best brands purchased. It was generally prepared at each feeding by adding hot water which, in most cases, had been boiled.

Store Milk.—This is the poorest grade of milk sold in New York, but varies at the different stores. It is kept in large cans in the small stores and is sold to customers at an average price of four cents a quart. It averages about 3.75 per cent. of fat. It is customary for milk to be purchased twice a day and it is carried home and kept in pails or pitchers. In summer it is usually heated at once; if it curdles, it is considered to be unfit for use and is returned. During the hot days of the summer of 1901, it frequently happened that milk obtained from two or three consecutive stores would curdle. Heating is usually done in a saucepan and the temperature is raised to a point where the milk begins to "foam," seldom to a boiling point. In most cases it is kept upon ice. It is usually prepared for the infant at each time of feeding. The only modification practised is, in most cases, dilution with water or barley water, equal parts being as a rule given when infants are about three months old and continued until ten or eleven months when whole milk is given. The bacteriological examination made of this milk during the summer of 1901 showed it to contain from 4,000,000 to 200,000,000 microorganisms, an average of about 20,000,000 per c.c. The form of heating employed killed, it was found, about 95 to 99 per cent. of the bacteria present. In the summer of 1902, owing partly to the cooler season, but chiefly to the new regulations of the Health Department regarding the care and sale of milk, the average was about 3,000,000 per c.c. During the winter the number of bacteria ranged from 100,000 to 5,000,000 bacteria per c.c., and averaged about 400,000 per c.c.

Bottled Milk.—The greater part of the bottled milk used in these tenements was handled by one of the largest dealers in the city. This milk was produced under conditions which were only fairly good. However, it was so well handled during transportation and delivery that it was nearly always in good condition when received by the consumer. This milk averaged about 500,000 bacteria per c.c. It was sold in covered jars at eight cents a quart. The same general plan of modification was practised as with the store milk, and it was also in summer heated and usually in about the same way. As the people who purchased this were not so poor as those using store milk, they were more likely to use ice for keeping it.

Besides this bottled milk some special milk from the Walker-Gordon and Briarcliff Farms was furnished gratuitously to a limited number of cases for the sake of comparison but this was not widely enough used to admit of drawing conclusions sufficiently definite to be expressed in figures. This milk averaged about 10,000 bacteria per c.c.

Milk from Central Distributing Stations.—The greater part of this milk was supplied from the Straus Milk Depots of which there are a number scattered through the city, and from the diet kitchen of the Good Samaritan Dispensary, a small quantity from other diet kitchens. The milk used at these places was generally of excellent quality, usually from an "inspected" or "certified" farm, but it was mixed with poor cream. It was furnished gratis to those too poor to pay, and at a small charge, usually one cent a bottle, to others. This milk after the addition of cream averaged before Pasteurization nearly 2,000,000 bacteria per c.c.; after Pasteurization, about 500 per c.c.; after boiling, about 5 per c.c. It is supplied in small bottles, each one containing the quantity for a single feeding. The bottles are washed and sterilized at the central stations. The Straus milk

was generally Pasteurized; that from the Good Samaritan Dispensary was boiled. With both some attempt at modification was made, three or four standard formulas being used. The common modification consisted in the dilution with boiled water, the addition of lime water, milk sugar, and, in some cases, cream also; or the dilution with barley water and the addition of cane sugar. Regarding the use of these formulas, the quantity for one feeding, and the number of feedings daily, directions were usually given by the physicians in attendance at the Central Stations. As the mothers came daily for their milk, some constant supervision of the cases was thus possible, and many minor disturbances of digestion no doubt controlled by a proper variation in the food.

Infant Foods.—It was a surprise that the proprietary foods were so little used in the tenements, the expense being apparently the chief reason. Although they were given to a number of children observed, they were seldom used for a long time, or as the sole diet, and certainly cut no figure in the results. We have therefore not classified these cases separately.

Breast Feeding.—As already stated, the great majority of infants reared in tenements are breast-fed, at least for the first six months. No effort was made to collect many observations upon these children, but a few were introduced for the sake of comparison. It was thought at first to make a separate division of the children who were partly breast-fed, as it was the impression of some of the physicians who followed the cases that a decided difference existed between those who were partly nursed, usually at night, and those entirely fed. However, the general figures when tabulated did not show any very marked difference. The results seem to have depended rather upon the character of the other food.

In estimating the results obtained by the different methods of feeding two things were considered: first, the gain or loss in weight, and secondly, the amount of digestive disturbance, particularly diarrhea, which occurred in the different groups of infants. The cases have been divided according to results in four groups: (1) Those which did well. In this group are included the infants who made a substantial and generally a regular gain in weight during the period of observation, this usually amounting to from two to five pounds for the ten or twelve weeks, and those that had no diarrhea worth mentioning—usually both conditions existed together. (2) Those which did fairly, including those in which some diarrheal disturbance was present but not of a serious nor prolonged character, and in which the weight was either stationary or the gain very slight. Both these generally went together. (3) Those which did badly, including those in which considerable digestive disturbance, usually diarrhea, was present, or in which there was a loss in weight; generally here also both factors existed. (4) The fatal cases.

The following tables show in a condensed form the results obtained with the different foods employed in winter and in summer.

TABLE I. FOOD AND RESULTS.—WINTER.

	Did well.	Did fairly.	Did badly.	Died.	Totals
Store milk	47	6	2	0	55
Condensed milk	39	5	2	2	48
Good bottled milk	51	13	1	3	68
Milk from Central Distributing Stations	35	20	4	0	59
Best bottled milk	5	0	1	0	6
Breast feeding	7	1	0	1	9
Totals, excluding cases counted twice	156	41	8	6	211

TABLE II. FOOD AND RESULTS.—SUMMER.

	Did well.	Did fairly.	Did Badly.	Died.	Totals
Store milk	21	23	20	15	79
Condensed milk	22	20	14	14	70
Good bottled milk	37	23	29	9	98
Milk from Central Distributing Stations	84	33	24	4	145
Best bottled milk	9	3	0	0	12
Breast feeding	17	7	7	0	31
Totals, excluding cases counted twice	184	108	88	41	421

Season and Results.—Nothing could be more striking than the contrast between the results in winter and in summer. The general summary shows that of the 211 winter cases, 156 did well; 41 did fairly, 8 did badly and 6 died. In other words, what might be considered good results were shown in 93 per cent. of the cases, and bad results in only 7 per cent. Furthermore, in only one of the six deaths was the cause connected with the digestive tract.

Of the 421 summer cases, 184 did well, 108 did fairly, 88 did badly and 41 died. In other words, good results were obtained in 69 per cent. of the cases and bad results in 31 per cent. while in nearly all of the fatal cases death was due to diarrheal diseases. It should be remembered that all the children both winter and summer had the advantage of some continuous intelligent oversight, usually one visit a week and often two being made by the physicians. This supervision contributed in no small degree to the results in both groups of cases.

The difference in results in the summers of 1901 and 1902 was not great; the percentage of bad results in 1901 being 37; in 1902, 35. This may have been due to the slightly cooler season of 1902, or the better general quality of the city's milk. The proportion of children on the different varieties of milk varied somewhat in the two years, so that a strict comparison is difficult.

The showing made by the winter cases is most gratifying and was indeed a surprise to all. So large a percentage of good results by all methods of feeding, and apparently so little difference between them was not expected. Artificial feeding in the tenements in winter would seem to be comparatively a simple problem.

To what shall be ascribed the great difference between summer and winter results? There seem to be many factors, but a consideration of the facts accumulated indicate that heat is the primary factor and bacteria and their products a secondary

one, except when the contamination is extreme or pathogenic organisms are present.

The effect of continued heat upon the health of infants is shown in the number of cases of diarrheal diseases and the number of deaths during ing the months of the summer of 1901 in an institution in the country near New York City, where a fairly pure milk was fed raw. During the winter and spring there was almost no diarrhea; with the warm weather of June it increased, reaching its highest point in August. The comparative results with the breast and bottle-fed infants are also evident.

Month.	No. of Infants.	Food.	Deaths.
June	34	Breast milk	0
	25	Cows' milk	0
	38	Breast and cows' milk	0
	128*	Milk and barley food	0
	Total..225		
	Number of cases of diarrhea, 15; deaths, 0.		
July	32	Breast milk	0
	20	Cows' milk	3
	38	Breast and cows' milk	0
	124*	Milk and barley food	0
	Total..214		
	Cases of diarrhea, 38; total deaths, 3 (all bottle-fed).		
August	28	Breast milk	0
	18	Cows' milk	3
	32	Breast and cows' milk	4
	129*	Milk and barley food	2
	Total..207		
	Cases of diarrhea, 50; total deaths, 9.		

Food and Results.—(1) Store Milk.—The largest number of bad results were seen, as was expected, with the cheap store milk, where not only was the milk poorer, but the care at home less. The winter observations upon this milk included 55 cases in about half of which some method of partial sterilization was employed; in the remainder it was given raw. Of these 55 infants, 47 did well; 6 did fairly; only 2 did badly and none died. Combining those who did well and those who did fairly, we have what may be considered good results in 96 per cent. of the cases and bad results in only 4 per cent. There was little apparent difference in results between those taking raw and those taking heated milk.

Store milk was the food of 79 of the summer cases. Of these 21 did well; 23 did fairly; 20 did badly and 15 died; in other words, good results in 56 per cent. of the cases, and bad results in 44 per cent. In nearly all of these cases the milk was heated in some way before feeding; usually it was raised nearly to the boiling point. This had the effect, it was found, of killing about 99 per cent. of the micro-organisms present, but the milk still contained after such heating between 5,000 and 500,000 bacteria to the c.c. An interesting point of tolerance of such milk was noticed in many cases. A number of infants living in bad surroundings, yet who received fairly good care, took only cheap store milk and yet remained well throughout the entire summer. During 1901 some of the store milk was very bad, averaging on hot days over 100,000,000 bacteria per c.c.

(2) Condensed Milk.—There were 48 winter observations upon infants taking condensed milk; 39 children did well, 5 did fairly, 2 badly, and 2 died, *i.e.*, good results were seen in 92 per cent. and bad results in 8 per cent. of the cases.

There were 70 summer observations made upon infants taking condensed milk. Only 22 of these children did well, 20 did fairly, 14 badly, and 14 died; or 60 per cent. good results and 40 per cent. bad results.

The results with condensed milk can hardly be attributed to the bacteria, inasmuch as it was almost invariably prepared with boiled water and contained relatively a small number of micro-organisms before heating. These children were often apparently in good condition until attacked with acute disease, when they offered but little resistance and seemed to succumb more quickly than any other class of patients. In one family three healthy infants, triplets, five months old, were taken sick on the same day with vomiting and diarrhea; one died within twenty-four hours, one within two days, and the third within a week. A bacteriological examination of the prepared milk remaining in one bottle showed nothing noteworthy.

(3) Bottled Milk.—The better results observed with bottled milk should not be put down as entirely due to the character of the food. The people who purchased it were seldom so poor as those buying store milk; they were usually more intelligent and probably more careful in handling the milk. Often they had ice.

There were 68 winter observations on children fed upon bottled milk; of these 51 did well, 13 fairly, only 1 did badly, and 3 died. None of these deaths were due to intestinal disease. In other words, there were good results in 94 per cent. of the cases, and bad results in 6 per cent.

There were 98 summer observations upon infants fed on bottled milk; of these 37 did well, 23 fairly, 29 did badly, and 9 died. In other words, 61 per cent. of good results and 39 per cent. bad results. In these quite a number received the milk raw, but as in the other observations, as soon as any illness occurred, some form of attempt at sterilization was almost invariably practised.

It is interesting to compare these results with those seen with store milk just above them in the table. The percentage mortality with the better grade of milk is only about one-half that seen with either condensed or store milk, and yet the large number of infants who did badly brings the proportion of bad results with bottled milk almost up to that with the two preceding varieties. It was noteworthy, however, that among infants included as doing badly there was on the average less sickness than among those fed on store milk. It would seem therefore that good bottled milk as now used, while much less dangerous to life than cheap store milk, is still, judging by this proportion of failures, rather unsuccessful as a method of feeding.

(4) Milk from Central Distributing Stations.—There were 59 winter observations upon these

*Those on milk and barley food were all over twelve months old.

patients, of which 35 did well, 20 fairly, 4 did badly and none died. In other words, good results in 93 per cent. of cases and bad results in 7 per cent.

There were 145 summer observations upon infants fed in this way; of these 84 did well, 33 did fairly, 24 did badly, and 4 died. In other words, 81 per cent. of good results, and 19 per cent. bad results. In about one-half of these cases the milk was Pasteurized; in the remainder, with the exception of a group of 42 cases to be mentioned later, in which the milk was given raw, the milk was sterilized.

The great difference between these results and those obtained with the three forms of feeding already considered deserves special attention. The original milk used at the stations was of good quality, but not much better than the bottled milk generally used; with both some form of sterilization was practised. The difference in results is not explained by the difference in these two factors. There were others of importance which must be sought. A certain amount of constant supervision was exercised over these infants, as some one, usually the mother, came daily to the milk dispensary for the food. Changes could thus be readily made in the milk according to the child's condition. If symptoms of slight indigestion were present, the mother was instructed to dilute the milk; with more severe symptoms, milk was temporarily stopped, etc. This supervision seems to us of the greatest value and can hardly be secured so well in any other way. Again, a mother sufficiently interested in her baby to come or send daily several blocks for the milk is generally one who values what she receives and also the advice which goes with it. This food, obtained in separate bottles for each feeding, is generally regarded by the tenement population as not exactly milk but as something very special, and therefore entitled to much more consideration than any form of food which they could prepare themselves at home.

Another point of importance is that some systematic attempt at milk modification was made in the milk furnished from central stations. Although this could not be done as accurately as for a smaller number of patients, the results were certainly improved by it. Again what contributed, in no small degree to success with this plan of feeding, was that this milk was supplied in separate bottles for each feeding, that the quantity for one feeding was suitable for the child, and that only a proper number of feedings for the twenty-four hours was dispensed at one time. There was not, therefore, the temptation to overfeeding and too frequent feeding, which with other methods are so generally practised. Finally, the bottles in which it was kept were always properly cleansed, and sterilized, since this was attended to at the central station.

(5) Best Bottled Milk.—This was furnished to 18 infants living in the tenements, to discover whether any perceptible difference existed between the results with this milk and the other varieties. While these observations are not numerous enough to admit of any generalizations, they indicate what was previously believed, that, with the cleanest milk from the best cared for cattle, the smallest number of bad results occurred.

There were 12 infants placed upon this milk in summer; of these 9 did well, 3 fairly, there were none who did badly and no deaths. There were 6 infants upon this milk in winter, of whom 5 did well and 1 did badly.

The difference between very bad, highly contaminated milk, like that purchased at some of the small stores previous to 1902 and the best bottled milk, was in some cases very striking. Protracted diarrhea in infants who were taking store milk was often immediately improved and in several cases promptly cured by simply substituting clean milk, after an interval of no milk, for the previous food. In some severe cases, however, no improvement followed the purer milk.

Age and Results.—In 17 cases the ages were not recorded. Of the summer cases 217 were infants under six months; 191 were between six and twelve months, and 47 were over twelve months. The comparative results for the different ages are shown in the following table.

TABLE III. AGE AND RESULTS—SUMMER.

Age.	Did well. Per cent.	Did fairly. Per cent.	Did badly. Per cent.	Died. Per cent.
Under 6 months.....	52	16	19	13
7 to 12 months.....	34	32	26	8
Over 12 months	49	32	19	0

Of the winter cases 123 were infants under six months, and 74 from seven to twelve months; none was over twelve months.

TABLE IV. AGE AND RESULTS—WINTER.

Age.	Did well. Per cent.	Did fairly. Per cent.	Did badly. Per cent.	Died. Per cent.
Under 6 months.....	74	21	0	5
7 to 12 months.....	70	20	10	0
Over 12 months.....	..	..	..	..

These figures indicate a considerably higher mortality in infants under six months, but a surprisingly large proportion of infants over this age who did badly. In summer, other factors than the milk used must be taken into account, one of the most important being the unwise giving of table food to infants over six months old, a practice which is almost universal in the tenement population. Giving fruits even to infants is also an important cause of illness. This was strikingly seen among the Italians. In this class of the population it was the opinion of some of the physicians who observed these cases, that the use of fruit, often unripe, stale or partly decayed, was the cause of more illness in infants and young children than the impure milk.

A separate study has been made of these cases which did badly, and the fatal cases, to determine any other factors beside the food and age which contributed to the results. An attempt was made to discover what sort of care these infants received, what their surroundings were, and whether the results in feeding were due to con-

ditions or diseases entirely outside the digestive tract.

Cases Doing Badly.—There were 96 infants who did badly, *i.e.*, they lost weight during the period of observation and had more or less disease of the digestive tract. Eighty-eight of these were summer cases and 8 were winter cases. The previous condition of this group of infants does not throw any special light upon results. This is noted in 86 of the 96 cases. In 52 the previous condition was put down as "good," and in 30 as "not good." It should be remembered that no infants previously in bad condition were included in the observations. The proportion of "good" and "not good" is about the same as in the children taken as a whole.

Care.—In the 88 summer cases this was not stated in 14; 30 were reported as receiving good care, 20 as having fair care, while 24 were positively neglected. The importance of the care the children received, as affecting the results of infant feeding, cannot be expressed in figures. What is included here as neglect was often of the grossest kind. As for example, where a mother was away all day at work and the infant left in charge of some old man, or irresponsible child, and where the visitor found bottles dirty, nipples rolling about the floor, sour milk in the feeding bottles, etc. It was practically the unanimous opinion of the physicians who made the observations that intelligent care had more to do with the results of feeding than any other factor. Many individual instances were reported of infants living under the worst surroundings and whose food was a very inferior kind of milk, and yet if the mother was intelligent and the infant well cared for, it throve in spite of the unfavorable conditions. On the other hand if the infant had no proper care it made little difference how good the milk furnished might be, the results were usually bad. One case will serve as an illustration. An Italian child two months old who had an intelligent, careful mother, did well for the entire summer on store milk. The following winter the mother was ill for a long time, during which time the child ran down steadily in spite of the fact that it was older and the weather was cold.

Surroundings.—While surroundings had a distinct influence upon the results in feeding, they were decidedly of less importance than the care. Since all these infants lived in tenements none could be said to have good surroundings. They were fair in 40 of the summer cases; distinctly bad in 33; in 15 they were not noted. Of the 8 winter cases, 7 had fairly good surroundings. By bad surroundings are meant very crowded apartments, rear tenements or basements. Many infants living in such places were rarely taken into the open air. Where the mothers availed themselves of the opportunities offered for day excursions upon the water and such fresh air as even the crowded city afforded, a distinct improvement was seen in the condition of the children.

Diarrheal Diseases and Other Forms of Acute Illness.—The number of days of diarrhea indicates pretty well the nature of the symptoms from which these infants chiefly suffered. Of the 88 cases which did badly, only 3 had no diarrhea; 19 had diarrhea lasting from one to seven days; 19, diarrhea from eight to fourteen days; 47, diarrhea of more than two weeks' duration. Other complications were present in 11 cases: bronchitis in 5; pertussis in 2; otitis in 1, and pneumonia in 3 cases. Of the 8 winter cases which did badly, none had diarrhea, but three had other complications, viz., one had measles, one bronchitis, and one pertussis.

Fatal Cases.—Of the 632 children observed, 47 or 7.5 per cent. died during the three months of observation. The mortality of the 211 winter cases was 2.8 per cent.; of the 421 summer cases, 11.3 per cent. Of infants under one year, neither in the age nor the previous conditions do we find any sufficient explanation of the fatal result. In the 47 observed who were over one year, no deaths occurred. The care which the fatal cases received is significant. Only 16 of the 47 infants who died received good care, and 19 were recorded as positively neglected. In 21 of the cases the surroundings were bad. The causes of death in the fatal cases were as follows:

Disease.	Summer.	Winter.
Diarrheal diseases	32	1
Pneumonia	5	2
Tuberculosis	2	0
Rickets	1	0
Diphtheria	1	0
Marasmus	0	1
Accident	0	1
Unknown	0	1
	41	6

The winter case having diarrhea was fed upon good bottled milk sterilized, and had gastric as well as intestinal symptoms. The marasmus case was a child fed upon condensed milk. In only two of the winter deaths could the result be definitely connected with the feeding; while in summer this was true of 30 of the cases.

Heated Milk vs. Raw Milk for Infants.—During each of the summers of 1902 and 1903, a special lot of milk was modified at one of the Straus depots for a group of 50 infants, all of whom were under nine months of age, and distributed daily in the usual way. To one-half the infants the milk was given raw; to the other half, Pasteurized.

The modified milk was made from a fairly pure milk mixed with ordinary cream. The bacteria contained in the milk numbered on the average 45,000 per c.c., in the cream 30,000,000. The modified raw milk taken from the bottles in the morning, averaged 1,200,000 bacteria per c.c.; the Pasteurized, about 1,000; taken in the late afternoon of the same day, they had respectively about 20,000,000 and 50,000.

Twenty-one predominant varieties of bacteria were isolated from six specimens of this milk collected on different days. The varieties represented the types of bacteria frequently found in milk. The infants were selected during the first week in June, and at first all were placed on Pasteurized milk. The 50 infants which had

been selected were now separated into two groups as nearly alike as possible. On June 15, the milk was distributed without heating to one-half the infants, the other half receiving as before the heated milk. In this way the infants in the two groups received milk of identically the same quality, except for the changes produced by heating to 165° F. for thirty minutes. The infants were observed carefully for three months and medical advice was given when necessary. When severe diarrhea occurred barley water was substituted for milk.

The first season's trial gave the following results. Within one week 20 out of the 27 infants put on the raw milk suffered from moderate or severe diarrhea; while during the same time only 5 cases of moderate, and none of severe diarrhea occurred in those taking Pasteurized milk. Within a month 8 of the 27 had to be changed from raw back to heated milk, because of their continued illness; 7 or 25 per cent. did well all summer on raw milk. On the other hand of those receiving the Pasteurized milk, 75 per cent. remained well, or nearly so, all summer, while 25 per cent. had one or more attacks of severe diarrhea. There were no deaths in either group of cases.

During the second summer a similar test was made with 45 infants. Twenty-four were put on raw modified milk; 13 of these had serious diarrhea, in 5 of whom it was so severe that they were put back upon heated milk; 10 took raw milk all summer without bad effects; 2 died, 1 from gross neglect on the part of the mother, the other from diarrhea. Of the 21 on Pasteurized milk, 5 had severe attacks of diarrhea, but all were kept on this milk except for short periods, when all food was omitted; 16 did well throughout the summer. One infant, markedly rachitic, died.

The outcome of these observations during the two summers are summarized in the following table:—

Kind of Milk.	Number of infants.	Remained well for entire summer.	Number having severe or moderate diarrhea.	Average number days off milk during summer	Average weekly gain in weight.	Average number days diarrhea.	Deaths.
Pasteurized milk, 1,000 to 50,000 bacteria per c.c.	41	31	10	3	4 oz.	3.9	1
Raw milk, 1 200,000 to 20,000,000 bacteria per c.c.	51*	17	34	5·5	3.5 oz.	11.5	2

Although the number of cases was not large, the results, almost identical during the two summers, indicate that even a fairly pure milk when given raw, in hot weather, causes illness in a much larger percentage of cases than the same milk given after Pasteurization. A considerable percentage of infants, however, do apparently quite as well on raw as on Pasteurized milk.

Observations Upon the Use of Feeding Raw and Heated Milk in Older Children.—The children over three years of age who received unheated milk, containing at different times from 145,000 to 350,000,000 bacteria per c.c., showed almost no gastro-intestinal disturbance. The conditions at three institutions will serve as examples.

In the first of these an average grade of raw milk was used which, during the summer contained from 2,000,000 to 30,000,000 bacteria per c.c. This milk was stored in an ice-box until required. It was taken by the children unheated and yet no case of diarrhea of sufficient gravity to send for a physician occurred during the entire summer. This institution was an orphan asylum containing 650 children from three to fourteen years of age; viz., three to five years, 98; five to eight years, 162; eight to fourteen years, 390.

A second institution used an unheated but very pure milk which was obtained from its own farm. This milk averaged 50,000 bacteria per c.c. The inmates were 70 children of ages ranging from three to fourteen. In this institution not a single case of diarrheal disease of any importance occurred during the summer.

In a third institution an average grade of milk was used which was heated. This milk before heating contained 2,000,000 to 20,000,000 bacteria per c.c. The institution was an infant asylum in which there were 126 children between the ages of two and five years. There were no cases of diarrhea during the summer.

These clinical observations taken in connection with the bacteriological examination at the laboratory show that, although the milk may come from healthy cattle and clean farms, and be kept at a temperature not exceeding 60° F., a very great increase in the number of bacteria may occur. Furthermore, this may occur without the accumulation in the milk of sufficient poisonous products or living bacteria to cause appreciable injury in children over three years of age, even when such milk is consumed in considerable amount and for a period extending over several months. Milk kept at temperatures somewhat above 60° F. was not met with in our investigations, but the histories of epidemics of ptomain poisoning teach that such milk may be very poisonous. It is also to be remembered that milk abounding in bacteria on account of its being carelessly handled is also always liable to contain pathogenic organisms derived from human or animal sources.

Results with Very Impure Milk Heated vs. Those with Pure or Average Milk Heated.—During the summer of 1901, we were able to observe a number of babies fed on milk grossly contaminated by bacteria. In 1902, a systematic oversight of all stores selling milk was instituted by the Health Department, so that the very worst milk was not offered for sale that summer.

* Thirteen of the 51 infants on raw milk were transferred before the end of the trial to Pasteurized milk because of serious illness. If these infants had been left on raw milk, it is believed by the writers that the comparative results would have been even more unfavorable to raw milk.

TABLE SHOWING THE RESULTS OF FEEDING DURING JULY AND AUGUST, 1901, IN TENEMENT HOUSES, OF 112 BOTTLE-FED INFANTS UNDER ONE YEAR OF AGE, AND OF 47 BOTTLE-FED INFANTS BETWEEN ONE AND TWO YEARS OF AGE WITH MILK FROM DIFFERENT SOURCES, AND THE NUMBER OF BACTERIA PRESENT IN THE MILK.

Character of milk.	Infants under one year.					Infants over one year.				
	Number of infants.	Average weekly gain.	Diarrhea. Mild.	Diarrhea. Severe.	Deaths.	Number of infants.	Average weekly gain.	Diarrhea. Mild.	Diarrhea. Severe.	Deaths.
(1) Pure milk boiled and modified at dispensary or stations; given out in small bottles. Milk before boiling averaged 20,000 bacteria per c.c.; after boiling 2 per c.c.	41	3 oz.	10	8	1*	.....	.....	.....	.....	.....
(2) Pure milk 24 hours old, sent in quart bottles to tenements, heated and modified at home, 20,000 to 200,000 bacteria per c.c. when delivered.	23	4⅛ "	8	5	0	24	4⅛ oz.	8	2	0
(3) Ordinary milk 36 hours old, from a selected group of farms, kept cool in cans durtransport; 1,000,000 to 25,000,000 bacteria per c.c., heated and modified at home before using.	18	4 "	6	6	1†	12	4 "	1	2	0
(4) Cheap milk, 36 to 60 hours old, from various small stores, derived from various farms, some fairly clean, some very dirty; 400,000 to 175,000,000 bacteria per c.c.	21	¼ "	4	13	4‡	7	½ "	1	3	0
(5) Condensed milk of different brands. Made up with hot water. As given, contained bacteria from 5,000 to 200,000 per c.c.	9	¼ "	5	2	3	4	3⅞ "	1	3	0
(6) Breast Milk	16	2¾ "	5	2	0					

The observations upon the impure milk of 1901 are of sufficient importance to be given in detail, although already mentioned in this report in the observations upon infants of both summers which were fed on "store milk." A group of over 150 infants was so divided that 20 per cent. were allowed to remain on the cheapest store milk which they were taking at the time. To about the same number was given a pure bottled milk from Briarcliff Farms, sent to their homes free of charge by Mr. Walter W. Law. A third group was fed on the same quality of milk as the second, but sterilized and modified at the Good Samaritan Dispensary. A fourth group received milk from an ordinary dairy farm. This milk was sent to a store in cans and called for by the people. A few infants fed on breast and condensed milk were observed for control.

In estimating the significance of the observations recorded in the tables, one should bear in mind that not only do different infants possess different degrees of resistance to disease, but that, try as hard as the physicians could, it was impossible to divide the infants into groups which secured equal care, and were subjected to exactly the same conditions. It was necessary to have the different groups in somewhat different parts of the city. It thus happened that the infants on the cheap store milk received less home care than the average, and that those on the pure bottled milk lived in the coolest portion of the city. Certain results were, however, so striking that their interpretation is fairly clear. It is to be noted that the number of infants included in each group is small.

There is nothing in the observations to show that fairly fresh milk from healthy cows, living under good hygienic conditions and containing, on some days, when delivered, as many as 200,000 bacteria per c.c., had any bacteria or any products due to bacteria that remained deleterious after the milk was heated to near the boiling point.

On the other hand it is possible that certain varieties of bacteria may, under conditions that are unsanitary, find entrance to milk and survive moderate heat or may develop poisonous products resistant to heat in sufficient amount to be harmful, even when they have accumulated to less than 200,000 per c.c.

Turning now to the results of feeding with milk which has been heated and which before sterilization contained from 1,000,000 to 25,000,000 bacteria per c.c., averaging about 15,000,000, though obtained from healthy cows living under fairly decent conditions and kept moderately cool in transit, we find a distinct increase in the amount of diarrheal disease. Though it is probable that the excessive amount of diarrhea in this group of children was due to bacterial changes which were not neutralized by heat or to living bacteria which were not killed; yet it is only fair to consider that the difference was not very great and that the infants of this group were under surroundings not quite as good as those on the purer milk.

Finally, we come in this comparison to the infants who received the cheap store milk Pasteurized. This milk had frequently to be returned because it curdled when boiled, and contained, according to the weather, from 4,000,000 to 200,000,000 bacteria per c.c. In these infants the worst results were seen. This is shown not only by the death rate, but by the amount and the severity of the diarrheal diseases, and the general appearance of the children as noted by the physicians. Although the average number of bacteria in the milk received by this group is higher than that received by the previous group, the difference in results between this group and the previous one can hardly be explained by the difference in the number of bacteria. The varieties of bacteria met with in this milk were more numerous than in the better milk, but we were unable to prove that they were more dangerous. Probably the higher temperature at which the milk was kept in transit and the longer interval between milking and its

* This infant died from enteritis and toxemia.
† This infant died of pneumonia. There had been no severe intestinal disorder noted.
‡ One of the four had pertussis, the remaining three died from uncomplicated enteritis.

use allowed more toxic bacterial products to accumulate.

Observations Upon Milk Feeding in Institutions.—During the summer of 1901, observations were made by Dr. Long in nearly all the institutions for children situated in New York City. He found, with three exceptions, that no particular care was taken to secure a supply of pure milk. Samples taken from the supply of the other institutions showed that the milk averaged over 1,000,000 bacteria per c.c. when delivered, and at half of them it averaged over 10,000,000 per c.c. The cream frequently contained 60,000,000 bacteria per c.c. The milk at two places contained at times over 100,000,000. At several special hospitals for young children the milk and cream contained on different days from 26,000,000 to 157,000,000 bacteria per c.c. Formaldehyde was also occasionally found, especially in the cream. Samples of milk were taken weekly from most of the institutions and examined as to the number of bacteria and in some cases also as to the varieties present.

As a rule to the children who were over three years old the milk was given raw, while for those under two years it was heated (sterilized). For those between two and three years, it was sometimes heated, sometimes not. In only two institutions was it possible to trace any epidemic of diarrhea among the infants and older children, and in these, the particulars of which are given below, the results cannot be reasonably attributed to the milk.

The first epidemic of diarrhea occurred at the New York Infant Asylum during June and July, 1901. There were in the institution 86 infants; 30 of these were bottle-fed and 56 were on breast milk. Of the 30 bottle-fed infants, 22 suffered from diarrhea. Of the 56 breast-fed infants, only 7 were affected. The epidemic was mild in character, only 2 infants dying.

This epidemic, which occurred during and after a period of very hot weather, at first glance might be ascribed to the milk. The fact, however, that 7 cases occurred among the breast-fed infants, that the cases occurred from time to time, not simultaneously, and that the milk used had been previously heated, points rather to an infection communicated from the sick to the well than to one conveyed by the milk, unless it was true that the milk had been contaminated in the wards.

In another institution an epidemic of moderately severe diarrhea occurred during the winter, in which at first all the cases came from one ward, and then later from a second ward. In this epidemic, infection through the milk was not conceivable, since the bottle-fed infants in the wards where no illness occurred received milk from the general supply.

General Conclusions.—In addition to the statistical reports of their observations, the different physicians who watched the infants in their homes were asked to state their own conclusions regarding the general problem of infant-feeding in the tenements. These general impressions are most suggestive and cannot fail to be of interest to all who are working at this difficult problem.

It was practically the unanimous opinion that the most important factor in securing good results is intelligent care. This covers much: clean bottles and nipples; the willingness and ability to carry out directions as to methods of feeding, quantities, frequency, the stopping of milk at the first signs of serious diarrhea, etc.; proper care of the milk itself while in the house, and methods of sterilizing; suitable clothing and cleanliness of the children, and as much fresh air as possible.

Most of the physicians stated that, leaving out the very worst store milk in summer, the results were much less affected by the character of the milk than they had anticipated, and distinctly less than by the sort of care the infants received.

The surroundings alone had much less influence on results than was anticipated. For not only were breast-fed infants found doing well under the most unfavorable surroundings, but those also who received only the bottle as a rule did well, provided they received intelligent care and good milk.

The depressing effects of great atmospheric heat, *i.e.*, a temperature in the neighboorhood of 90° F., or over, were very marked in all infants no matter what their food. Those who were ill were almost invariably made worse, and many who were previously well became ill. A bad method of feeding, or rather a feeding without any method, was responsible for many failures when the milk itself was of good quality. Common mistakes were, feeding an infant every time it cried; giving it a full bottle no matter what the age of the child, and letting it take as much as it would; preparing a large bottle of food at one time, and warming it over from time to time until the child had taken the whole of it, or allowing the milk to turn sour in the feeding bottle. Quantities proper for single feedings were almost invariably disregarded. Proper washing of feeding bottles was seldom seen in a tenement house. Such matters as these are closely connected with intelligent care, which has been already considered.

The importance of the matters just mentioned, raises the question of how much can be accomplished by the distribution of printed slips of directions. It was the observation of the physicians that comparatively little can be accomplished by these alone. Such printed circulars are often treated by the tenement-house mother very much as most of us treat the printed advertisements which are left at our doors—seldom read and soon thrown away. Mothers are often anxious and willing, but ignorant and stupid. Many cannot read and many more have not the wit to apply in practice what they read. When however, such printed advice was preceded or accompanied by personal explanation, it was found of great assistance. Personal contact is the only sure way to influence these people, and this must be frequently repeated to influence them permanently; as an aid to this, printed slips are useful. Printed direc-

tions, however, should be as simple as possible in statement, few in number, and touch only the most vital matters, telling the mother always what she is to do, not what she is not to do.

Summary.—The observations here recorded were made upon the groups of infants for periods of about three months only, and the conclusions drawn relate especially to the more immediate effects of the milk.

1. During cool weather neither the mortality nor the health of the infants observed in the investigation, was appreciably affected by the kind of milk or by the number of bacteria which it contained. The different grades of milk varied much less in the amount of bacterial contamination in winter than in summer, the store milk averaging only about 750,000 bacteria per c.c.

2. During hot weather when the resistance of the children was lowered, the kind of milk taken influenced both the amount of illness and the mortality; those who took condensed milk and cheap store milk did the worst, and those who received breast milk, pure bottled milk, and modified milk did the best. The effect of bacterial contamination was very marked when the milk was taken without previous heating; but, unless the contamination was very excessive, only slight when heating was employed shortly before feeding.

3. The number of bacteria which may accumulate before milk becomes noticeably harmful to the average infant in summer, differs with the nature of the bacteria present, the age of the milk, and the temperature at which it has been kept. When milk is taken raw, the fewer the bacteria present the better are the results. Of the usual varieties, over 1,000,000 bacteria per c.c. are certainly deleterious to the average infant. However, many infants take such milk without apparently harmful results. Heat above 170° F. (77° C.) not only destroys most of the bacteria present, but, apparently, some of their poisonous products. No harm from the bacteria previously existing in recently heated milk was noticed in these observations unless they had amounted to many millions, but in such numbers they were decidedly deleterious.

4. When milk of average quality was fed sterilized and raw, those infants who received milk previously heated did, on the average, much better in warm weather than those who received it raw. The difference was so quickly manifest and so marked that there could be no mistaking the meaning of the results. The bacterial content of the milk used in the test was somewhat less than in the average milk of the city.

5. No special varieties of bacteria were found in unheated milk which seemed to have any special importance in relation to the summer diarrheas of children. The number of varieties was very great, and the kinds of bacteria differed according to the locality from which the milk came. None of the 139 varieties selected as most distinct among those obtained, injured very young kittens when fed in pure cultures. A few cases of acute indigestion were seen immediately following the use of Pasteurized milk more than thirty-six hours old. Samples of such milk were found to contain more than 100,000,000 bacteria per c.c., mostly spore-bearing varieties. The deleterious effects, though striking, were not serious nor lasting. At the present time there is in New York City, no general sale from stores of "Pasteurized" or "sterilized" milk, so that it is here very rare for such milk to be used thirty-six hours after heating.

6. After the first twelve months of life, infants are less and less affected by the bacteria in milk derived from healthy cattle. According to these observations, when the milk had been kept cool the bacteria did not appear to injure the children over three years of age, at any season of the year, unless in very great excess.

7. Since a large part of the tenement population must purchase its milk from small dealers, at a low price, everything possible should be done by Health Boards to improve the character of the general milk supply of cities by enforcing proper legal restrictions regarding its transportation, delivery, and sale. Sufficient improvements in this respect are entirely feasible in every large city to secure to all a milk which will be wholesome after heating. The general practice of heating milk which has now become a custom among the tenement population of New York is undoubtedly a large factor in the lessened infant mortality during the hot months.

8. Of the methods of feeding now in vogue that by milk from central distributing stations unquestionably possesses the most advantages, in that it secures some constant oversight of the child, and since it furnishes the food in such a form that it leaves the mother least to do, it gives her the smallest opportunity of going wrong. This method of feeding is one which deserves to be much more extensively employed, and might, in the absence of private philanthropy, wisely be undertaken by municipalities and continued for the four months from May 15 to September 15.

9. The use, for infants, of milk delivered in sealed bottles, should be encouraged whenever this is possible, and its advantages duly explained. Only the purest milk should be taken raw, especially in summer.

10. Since what is needed most is intelligent care, all possible means should be employed to educate mothers and those caring for infants in proper methods of doing this. This, it is believed, can most effectively be done by the visits of properly qualified trained nurses or women physicians to the homes supplemented by the use of printed directions.

11. Bad surroundings, though contributing to bad results in feeding are not the chief factor. It is not, therefore, merely by better housing of the poor in large cities that we will see a great reduction in infant mortality.

12. The observations indicate that close percentage modification of milk, although desirable in difficult cases, is not necessary to obtain excellent results with the great majority of infants,

and that a certain adjustment of a healthy infant to its food is usually soon secured.

13. While it is true that even in the tenements the results with the best bottle-feeding are nearly as good as average breast-feeding, it is also true that most of the bottle-feeding is at present very badly done so that as a rule the immense superiority of breast-feeding obtains. This should, therefore, be encouraged by every means, and not discontinued without good and sufficient reasons. The time and money required for artificial feeding, if expended by the tenement mother to secure better food and more rest for herself, would often enable her to continue nursing with advantage to her child.

14. The injurious effects of table food to infants under a year old, and of fruits to all infants and young children in cities, in hot weather, should be much more generally appreciated.

THE DEGREE TO WHICH SUBSTANCES AGGLUTINATING THE DYSENTERY BACILLI ARE PRESENT IN THE BLOOD OF NON-INFECTED PERSONS.*

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THIS study was undertaken to determine (1) whether the different varieties of the dysentery bacillus of Shiga, would not react with serum from individuals suffering from various diseases (2) whether the acid and the non-acid types would not react differently with the same serum and (3) whether, if the bacilli reacted with the blood of adults the blood of infants also possessed the agglutinating substance. Recent observations tend to show that reaction of these bacilli to non-dysenteric serum does occasionally occur in fairly high dilutions, but the data so far obtained have been insufficient to determine the exact extent to which this reaction takes place. Several rather interesting questions rest on these observations. In the first place, can it be predicated that agglutination of dysentery bacilli of the various types, occurs only with diluted serum from patients suffering, or having recently suffered, from infection with one or more types of dysentery bacilli; and in the second place, if in some dilution it does so occur, within what limits can it be regarded as proof of such infection.

It has been held by various observers, including Shiga, Flexner, Kruse and others, that the agglutination of the dysentery bacilli which is caused by the serum of patients suffering from acute epidemic dysentery, and which resembles the Gruber-Widal reaction, is sufficiently distinctive to be pathognomonic of that disease. Shiga, Kruse, Flexner, Park and Dunham, Strong, and Vedder and Duval all succeeded in isolating from dysenteric stools bacilli which gave the specific reaction and which have been until recently regarded by the investigators themselves as practically identical in all respects. Vedder and Duval, after an exhaustive comparative study of all these bacilli, came to the following conclusion, as set forth in the *Journal of Experimental Medicine*, for February, 1902: "We are therefore forced to the conclusion that the cultural characteristics are essentially alike;" and "we have been unable to discover any real or constant differences between the varieties." This study included bacilli isolated by themselves in Philadelphia, New Haven and Lancaster.

Speaking of the various bacilli, Dr. Flexner says, in the *University of Pennsylvania Medical Bulletin*, August, 1901: "The serum reactions have been of greatest importance. They are, moreover, unmistakable in significance; they indicate close relationship between the bacilli from Japan, Manila, Porto Rico and Germany, and they further render probable the identity of the epidemic dysentery of this country with that of the East and Germany." Dr. Flexner's comparative study included cultures obtained from Shiga, Kruse, Strong, and from his own assistants and no essential differences were found. Such morphological variations as were observed were referred to the medium, the temperature, and the rapidity of division and growth. Kruse laid no stress on differences found. Shiga says in his article on dysentery in *Twentieth Century Medicine*: "I have shown that Flexner's and Kruse's bacilli were agglutinated by the serum of a dysenteric patient in Japan and that therefore this test is sufficient to establish their identity with my own *Bacillus dysenteriæ*."

Several extensive outbreaks of dysentery occurring in this country were studied by Drs. Park and Dunham (*N. Y. Univ. Bulletin of the Medical Sciences*, Oct., 1902), including cases occurring at Tuckahoe, Mount Vernon and Waverly, in New York, Lakewood, N. J., Seal Harbor, Me., and a few in New York City. The dysentery bacilli were obtained from a typical case in Seal Harbor, from a similar case in Tuckahoe and from a number in New York City. In many cases in which no cultures were attempted serum was obtained and all of those having typical dysentery symptoms and giving a positive serum reaction were regarded as probably due to one or more of the varieties of the Shiga bacillus. Nearly all of the Tuckahoe cases gave a positive reaction, either typical or fairly so, within one hour in a 1 to 10 dilution. Twelve out of the 22 cases examined gave a positive reaction in a 1 to 50 dilution within one hour. These tests were made from four to eight weeks after the abatement of symptoms. Three months later the reaction was much weaker. Four out of six cases examined at Mount Vernon gave a positive reaction within one hour in a 1 to 20 dilution. Of the Lakewood cases three were examined two months after convalescence was established. One gave prompt reaction in a 1 to 50 dilution, another gave a moderate reaction, and the third was negative. Of the cases at Seal Harbor one gave a positive re-

*Wm. T. Lusk Memorial Prize Essay, 1903.

action and another gave none. Of cases in New York 8 out of 18 gave a positive reaction in one hour in a 1 to 10 dilution. Three of these cases had simple diarrhea symptoms and failed to react.

The acid-producing type of the Shiga bacillus was obtained from a number of cases of dysentery at the Foundling and Babies' hospitals by Dr. Martha Wollstein and at the Nursery and Child's Hospital by Dr. Katherine R. Collins. The ages of the infants varied from a few months to several years. The blood serum gave a positive reaction in about one-half the cases with the Shiga from those obtained by Shiga in Japan and Flexner in New Haven. They also differ from the latter in producing indol in peptone solution."

In regard to agglutination, Shiga says "That the blood of dysenteric patients during convalescence is able to agglutinate the *Bacillus dysenteriæ* (so-called Widal reaction), I have proven by hundreds of observations. Some reactions are positive in 1 to 130 dilutions. Usually, however, the reaction is positive in 1 to 20 or 50 dilutions. Occasionally in mild dysentery the reaction is negative." . . . "The agglutination tests

REACTIONS (CHILDREN UNDER FIVE YEARS)

	AGE	TIME	DILUTIONS (SHIGA) 1-10	1-20	1-50	1-100	(FLEXNER) 1-10	1-20	1-50	1-100
Bronchitis (mild)	4 years	3½ hours	F	S	N	N	S	N	N	N
" "	17 months	3 "	S	N	N	N	N	N	N	N
" "	9 "	2½ "	N	N	N	N	N	N	N	N
" "	18 "	3 "	S	N	N	N	S	N	N	N
" "	16 "	3 "	S	N	N	N	S	N	N	N
Indigestion	23 days	3½ "	N	N	N	N	N	N	N	N
"	7 months	3 "	N	N	N	N	N	N	N	N
"	3 "	3 "	N	N	N	N	N	N	N	N
"	3½ "	3 "	N	N	N	N	N	N	N	N
Cretinism	4 years	3½ "	G	F	S	N	F	F	N	N
Enuresis	4 "	3 "	S	N	N	N	N	N	N	N
Eczema	3½ "	3 "	G	F	S	N	F	F	N	N
Otorrhea	4½ "	3 "	F	G	S	S	F	F	S	N
Infantile syphilis	7 months	3 "	N	N	N	N	N	N	N	N
Acute rhinitis	10 "	3 "	S	N	N	N	S	N	N	N
Follicular tonsillitis	3 years	3 "	S	N	N	N	F	S	N	N
Pertussis	2 "	3 "	S	N	N	N	N	N	N	N
Varicella	3 "	2½ "	S	S	N	N	S	S	N	N
				INTESTINAL CASES						
Enteritis (alcoholic)	Adult	3 hours	C	G	S	S	G	S	S	S
"	"	3 "	G	S	N	N	G	S	N	N
Typhoid	"	3 "	G	F	S	S	G	G	G	G
"	"	3 "	G	S	G	S	G	G	G	G
Appendicitis	10 years	2½ "	G	G	G	N	G	G	N	N
"	9 "	3 "	G	C	G	F	G	C	F	S
"	11 "	3 "	G	F	F	F	F	F	S	F
Total cases, 114										
Complete reaction			7	1	0	0	1	1	0	0
Good "			49	18	4	0	31	8	2	2
Fair "			32	36	13	3	31	19	7	1
Slight "			20	38	54	26	40	44	24	12
Negative "			6	21	43	85	11	42	81	99
			114	114	114	114	114	114	114	114

bacillus (Flexner's acid-producing culture) in a 1 to 50 dilution.

In 13 cases of dysentery in adults in New York City Dr. Park obtained in 7 a positive serum reaction in a dilution above 1 to 20. Under "The Agglutination of the Shiga Bacillus by Sera from Cases in which no Suspicion of Shiga Bacillus Infection Exists," Drs. Park and Dunham say: "We have met with four sera from patients in whom no suspicion of infection with dysentery bacilli existed which agglutinated the Shiga bacillus in dilutions of 1 to 100. The bacilli from Seal Harbor and New York cases agree in agglutination properties with those sent us by Dr. Flexner, obtained from Manila and Baltimore, but differ conducted with the blood of persons sick with other diseases or healthy individuals were always negative, although such tests were tried (blood serum or blister exudate) in 12 healthy persons, 16 cases of typhoid fever, 3 of intestinal catarrh, 3 of beriberi." Shiga suggests that the agglutinating power of a serum may vary not only with the character of the epidemic, but also with the nationality of the patient. "Especially must it be mentioned that the maximum limit of the agglutination varies according to the technic employed and the individual judgment of the observer." In summing up he says further: "*Bacillus dysenteriæ* is agglutinated only by the blood of dysenteric patients; never by the blood of those

sick with other diseases or of healthy individuals."

In the *Deutsche medicinische Wochenschrift*, Oct., 1900, p. 637, Kruse says that many of the sera examined by him gave a reaction in dilutions of 1 to 100, 1 to 250, and one in a dilution of 1 to 1,000, while 25 specimens from well persons were either negative or gave a reaction only in dilutions of 1 to 10 or 1 to 20. Flexner found that with the Shiga, Kruse and Flexner bacilli "normal blood controls (1:10) were uniformly negative," but does not state how much time was allowed for reaction to occur. Lieut. Strong (Report Surg. Gen. of Army, 1900) tested his Manila bacillus with serum from 100 individuals. Of these 12 were well and the others were suffering from various disorders, as malaria, typhoid, rheumatism, tuberculosis, venereal diseases, paraplegia, abscess, acute mania, constipation, diarrhea, bronchitis, dengue, sprue, and 17 were surgical cases. Two gave a previous history of dysentery. In all these cases a 1 to 10 dilution was employed and observation made at the end of thirty minutes. The result showed a partial reaction in the case of one healthy individual and a positive reaction in one surgical case. The rest were all negative. Dr. Strong says: "The dilutions of blood serum used may be considered rather low for the time limit, but these 100 reactions seem to show that the agglutination does not occur with ordinary blood serum in these dilutions." He does not show by his table whether the two cases which did react were those which had previously suffered from dysentery. Dr. Strong in a letter to Dr. Flexner says, "The agglutination reaction is not invariable."

In the *Bulletin of the Johns Hopkins Hospital* for 1900, XI, p. 231, Dr. Flexner says, speaking of the agglutination test: "While the absolute value of this test in determining the specificity of bacteria may be open to doubt, its use in differentiation is now unquestioned." By this test a bacillus was separated (in Manila) of which he says on page 39: "Agglutination was constant and sensitive with blood-serum of host as well as the sera of other individuals suffering from dysentery. Inactive with normal serum and serum from cases of typhoid fever, malaria, and beriberi."

Vedder and Duval obtained positive agglutination reactions with dysenteric sera in one hour and in dilutions varying from 1:30 to 1:500. Loose skein clumping was observed by them and also by Kruse and Flexner. Shiga's antidysenteric serum clumped the Shiga bacillus in dilutions of 1 to 300 and 1 to 500, but failed to clump the acid-producing (Flexner) type in the same dilutions. Vedder and Duval remark that: "While the agglutinating properties of the bacilli from different sources are very much the same still there are differences in degree." (This I found to be true in my own observations of the Shiga and acid [Flexner] bacilli.) "Normal blood was frequently used as a control for the specific sera. We never obtained an agglutination in any of these control tests, no matter what dilution was used."

The Bacilli.—The bacilli employed were from Shiga's Japan (alkali type) and Flexner's Manila (acid type) cultures. They answered in all respects to the descriptions of the various observers, being slender rods with rounded ends, about 1 to 3 microns in length, appearing singly, sometimes also in pairs, but having no tendency to form groups. On agar and glucose agar involution forms rapidly developed and the bacilli also showed striking increase in length when multiplying in broth. They grew well both at room temperature and in the incubator. On agar and glucose agar the streak gave a growth of uniform width, at first whitish gray and translucent and later becoming yellowish or creamy and opaque, with crenated edges. Broth was uniformly clouded with sedimentation and no pellicle was formed. No differences in growth between the two were to be found in the ordinary media. The bacilli had very active Brownian movement, but no appreciable motility.

The clumping which occurred varied greatly in degree and was recorded under four heads. Skein clumping was frequently observed as a loose but fairly typical arrangement in which the bacilli were unusually long, were joined end to end and still adhered closely, leaving few or no free bacilli in the field. The term "complete" was applied only to those cases in which there were no free bacilli and in which practically all of the clumps were large. These were sometimes of the skein variety and sometimes much more compact. It is only fair to say that cases which showed as typical a reaction as this were comparatively few. The term "good" was applied to those cases in which there were found large and small clumps and a few free bacilli in the field. These cases were numerous, especially in dilutions of 1 to 10 and 1 to 20. Under the head of "fair" were classified those cases which showed fairly good sized clumps, but a great many free bacilli being found and retaining their Brownian movement to a considerable degree. Those cases were classified as "slight" which showed any uniform grouping, however little, well scattered over the field. In the negative cases there was no uniform attempt at grouping, although in some cases a few bacilli here and there would be found clinging together. The rest were all discrete and showing very active molecular movement.

By this classification an attempt has been made not only to signify the presence of a reaction, but to indicate as nearly as may be the degree of completeness of the clumping which occurred. It is believed that this multiplication of terms will tend to clearness rather than confusion and will contribute somewhat to the scientific exactness of the results. It seems scarcely sufficient to say simply that a reaction has or has not occurred when all degrees of clumping are possible and do occur. It must be remembered that the personal equation enters largely into observations of this sort and perhaps more extended classification may

help to reduce this to a minimum. No doubt many discrepancies in observation are due to individual differences in interpretation of what is seen. It is clearly impossible to create an absolute and arbitrary standard in agglutination work and the most that can be hoped for is a classification which will make the different degrees of clumping intelligible and fairly exact. It is possible that some cases which have been recorded by various observers as negative may have shown slight clumping which was passed over because it could not be considered a typical reaction. It is also quite possible that many of the cases recorded in this paper as showing slight clumping might be regarded by others as entirely negative. It is hoped that the classification employed will make clear what was actually found.

Technique.—These observations were made at the suggestion and under the direction of Prof. W. H. Park, in the Carnegie Laboratory of the New York University and Bellevue Hospital Medical College. The blood specimens were obtained at Bellevue Hospital and in the College Clinic. Inoculation was made upon agar from a stock culture and each day fresh streak cultures were made upon agar or glucose agar slants. These tubes remained in the incubator over night. Each day broth cultures were made from the twenty-four hour growth on agar and these were allowed to remain at room temperature over night for use on the following day. The ordinary hanging-drop preparation was employed and all dilutions were made with plain sterilized water. In all cases a hanging-drop of the plain broth culture was used as a control and this control drop failed to show the slightest clumping with either bacillus in any instance, the appearance corresponding exactly with that observed in specimens recorded as negative. The blood was gathered in capillary tubes and time allowed for the separation of clot and serum to take place. In some cases where this did not occur very thoroughly the drop contained many corpuscles and showed distinct color in low dilutions. It is not believed that this had any material influence upon the results obtained. Shiga used whole blood in many of his tests and places the agglutinating power of the blood at one-half that of the serum alone.

Even in those few cases in which evaporation had taken place through imperfect sealing of the tube, there was no marked difference in the results obtained, although the dilution was necessarily approximate. Observations were made at periods varying from one to eight hours, in the great majority of cases being made at the end of three hours. In the accompanying table "C" stands for complete, "G" for good, "F" for fair, "S" for slight, and "N" for negative.

RESULTS.—The difference between the agglutinating capability of the Shiga and Flexner cultures was quite noticeable. In most instances among the specimens of blood examined the acid type bacillus dropped out first and in a very few instances only did it exceed the alkali bacillus in agglutinating capability. It occasionally happened that the results were perfectly parallel, but these instances were comparatively rare except where no reaction occurred, as with the blood of infants. It is interesting to note that in the only two typhoid specimens which were obtained the Flexner culture gave good clumping in all the various dilutions, while the Shiga culture in one gave a good reaction in only a 1 to 10 dilution and in the other in 1 to 10 and 1 to 50 dilutions. That the clumping in the 1 to 50 dilution exceeded that in the 1 to 20 in this specimen may have been purely accidental, although it occasionally occurred that clumping was better in a 1 to 20 than in a 1 to 10 dilution.

In three cases of appendicitis which were examined the results show a more decided tendency to clump than in most cases not associated with any intestinal lesion. In one the Shiga culture gave good clumping in three hours in dilutions of 1 to 10 and 1 to 50, complete clumping in 1 to 20 and fair clumping in 1 to 100, while the Flexner culture gave good clumping in a dilution of 1 to 10, complete clumping in 1 to 20, fair clumping in 1 to 50 and slight clumping in 1 to 100. In no other instances was complete clumping found in a 1 to 20 dilution. It would be interesting to pursue the investigation farther in regard to appendicitis and typhoid cases. One case of alcoholic enteritis examined gave a marked reaction in a low dilution and some clumping all the way through. The cases of tuberculosis examined showed nothing very noteworthy except that two gave complete clumping with the Shiga bacillus in a 1 to 10 dilution. The cases of pneumonia gave no striking results, but two or three of them were convalescent.

To sum up, those cases which gave complete clumping with the Shiga culture in a 1 to 10 dilution were two of tuberculosis, one of malaria, one of alcoholic enteritis, one of acute pleurisy, one of pernicious anemia, and one surgical case. The only instances in which the Flexner culture gave complete clumping was in a case of pernicious anemia, in a 1 to 10 dilution and in a case of appendicitis in a 1 to 20 dilution. No complete clumping occurred with either culture in a higher dilution than this. The Shiga alkali culture was never negative in all dilutions except in the cases of infants under one year. The Flexner acid culture was negative throughout in the infantile cases, in three children of seven, four and two years, respectively, and in one adult. All patients were adults except those whose age is given in the table.

It was found in all cases of infants under one year that there was a complete absence of reaction, except in one case of a ten months' old child where very slight clumping occurred in a 1 to 10 dilution. While the number of cases examined was not sufficiently large to be conclusive, it seems probable that the agglutinating power in non-dysenteric serum is absent in children under one year. That it may be present in cases of dysentery in a 1 to 50 dilution or over is shown by the cases in

the Foundling and Nursery and Child's hospitals, many of whom were under one year. However, some of the cases in the Foundling and Nursery and Child's hospitals failed to give any reaction. Nearly all the children examined by me who were under five years gave proportionately less clumping than did children above that age. The serum from very few of the children between one year and five years gave any clumping above a 1 to 20 dilution and in only one of them was there good clumping in that dilution. Of all the persons examined there was only one in which there was any clumping whatever in a 1 to 100 dilution. It would seem, then, that the agglutinating power of the serum has some relation to the age of the individual, but this difference is less noticeable above the age of five years and depends greatly upon the intestinal condition. The adults examined included individuals of all ages and various nationalities.

Conclusions.—It is realized that these investigations are only tentative, but they seem to warrant certain conclusions:

1. That the serum of non-dysenteric adult patients does agglutinate the Shiga and acid type (Flexner) bacilli frequently in a 1 to 20 dilution and occasinally in a dilution as high as 1 to 100.

2. That this agglutinating power is wanting in the blood of non-dysenteric young infants (under one year) rarely being present even in a 1 to 10 dilution.

3. That there are certain differences in agglutinating capability between the Shiga and acid type (Flexner) bacilli, the former in these tests clumping somewhat more readily than the latter.

4. That a decided and prompt reaction, under two hours, with the *Bacillus dysenteriæ* in dilutions of 1 to 20 or higher in young subjects (under one year) and in 1 to 50 or higher in older persons who have not recently suffered from chronic or subacute intestinal disease, is probably pathognomonic of acute epidemic dysentery.

GENERAL CONVULSIVE TIC WITH COPROLALIA.

BY HARRY MORELL, M.D.,
OF LITCHFIELD, MINNESOTA.

CONVULSIVE tic or Gilles de la Tourette's disease is a rare motor neurosis characterized by violent involuntary twitchings. The movements, as a rule, affect the face, but in severe cases all the muscles of the body may be involved. Associated with the muscular movements, are explosive utterances which consist of inarticulate cries, sometimes resembling the bark of a dog; these cries or utterances are made suddenly and automatically and accompanied by grimaces and contortions of the facial muscles. At times the patient will shout at the top of his voice obscene or profane words. To this condition coprolalia has been applied. A word heard may be mimicked and parrot-like be repeated over and over again; this is termed echolalia, echokinesis when actions are imitated.

The patient with the fully developed disease suffers a great deal from the spasms, but, generally, retains his intelligence, although it may be impaired when the disease is of long standing. By energetic will power the patient may repress the twitchings for a time, but they return sooner or later with increased frequency and vigor, the same with the coprolalia, if the patient is alone and unobserved and away from noise and excitement, the barking may cease, as it did with the lad whose history is attached. This patient was isolated and did not make any outcry for two or three months, until a fire occurred in the vicinity where he was confined, when the barking and spasms returned and did not abate for a week. The cessation of the tic during work or being occupied with something where the mind is employed, is not only due to self-control, but also to the diversion of the attention.

Author's case of convulsive tic during spasmodic contraction, involving the depressor anguli oris and levator menti muscles.

This distressing affection has been taken for chorea.* "Tis has no more in common with chorea, be it acute or chronic, than it has with epilepsy; indeed, I am inclined to the opinion it has much less. Furthermore, it has absolutely nothing in common with acute, humoral, Sydenham's chorea, nor with degenerative, parenchymatous, Huntington's chorea, and that the term chorea should never be thought of in connection with this disease, and, finally, that tic being in a majority of instances a degenerative neurosis, it conforms in concurrence, in development, in progression, in obstinacy and unresponsiveness to treatment with other degenerative diseases."

Fully developed cases do not offer any difficulty of diagnosis. As long as the tic is confined to the facial muscles it may be confused with localized muscular spasms, but if it extends to the neck muscles the diagnosis is made probable; it is confirmed when coordinated tics are observed. In simple motor tic or tic douloureux convulsive twitching of the facial muscles is observed on the affected side. This is a reflex condition caused by

*Joseph Collins, MEDICAL NEWS, Dec. 11, 1897

irritation of some of the branches of the fifth nerve. Habit tic or facial spasm should not be confounded with general tic; in these the spasms are generally unilateral. In organic disease of the cortex, as cortical epilepsy, the spasms are observed to start in the facial muscles but soon extend to the arms and finally over the entire side.

The majority of the cases of this deplorable condition are chronic and progressive in character. Oppenheim has seen cases recover completely. Charcot has observed long remissions in some cases. As a rule one would be inclined to give rather a dubious prognosis as to a complete cure.

The following is a short history of one of these cases associated with coprolalia:

Case.—L. I., a young man eighteen years of age. His father is living and healthy. His mother died at the age of forty-three. Cause not known, but it was not a nervous affection. He has five brothers living; all are strong and healthy with the exception of one who is extremely nervous. The patient is robust and of splendid muscular development and, as far as he is aware, was never sick in his life. His father tells me that there were no unusual complications attending the patient's birth, nor convulsions in infancy. There are no anatomical stigmata present. When twelve years old he noticed that the muscles of his face would twitch. This twitching would come on very suddenly and involuntarily. The spasms gradually became more violent and extended to the muscles of the neck, to the shoulders and down to both arms, which twitch violently and simultaneously. Two years later, the lightning-like contractions of the muscles of the face were accompanied by a noise which resembled "hum" and "whoa;" these were alternated with a peculiar cry or bark at the top of his voice. Try as he might he could not control them. The patient has been in this condition for the past six years. If any unusual excitement occurs the barking is almost continuous. He says he is a nuisance to himself and everyone who comes within the range of his voice. It matters not where he is—on the street, in a shop or in a theater—he barks incessantly and at other times uses nasty language. He is an attraction wherever he is on account of his peculiar bark or cry and the distressing, uncontrollable facial contortions with the loud spasmodic sniffing.

In regard to the treatment. This patient has been given almost every drug recommended for this condition; in addition various therapeutic measures have been used, as baths, electricity, massage, etc. He has gone the rounds of the hospitals, and various practitioners have treated him, and the result has not been encouraging. When he presented himself to me, I placed him in isolation and gave nitrate of silver in increasing doses. After having been on this treatment for about three weeks the coprolalia had entirely left him and the tic was diminished somewhat. After two months of isolation the barking did not return until a fire occurred in the vicinity of the hospital, when the coprolalia and loud noises returned, which lasted a week or so. The patient was in isolation for eight months. During that time he seemed to improve, but after that, when he started to go out occasionally, the symptoms gradually returned. Since his return to "public life" the disease seems uninfluenced by the treatment given.

The illustration shows plainly the convulsive spasm of the muscles of the face.

THE TREATMENT OF ANTERIOR DISLOCATION OF THE SHOULDER, WITH REPORT OF A CASE IN WHICH REDUCTION WAS PREVENTED BY THE DETACHED GREATER TUBEROSITY.*

BY GEORGE TULLY VAUGHAN, M.D.,

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DISLOCATION of the shoulder is such a common injury and its treatment so important in order to prevent serious disability that no apology is needed for inviting your attention to what might seem a trite and uninteresting subject. It is variously estimated that from 40 to 65 per cent. of all dislocations are of the shoulder, and of these the large majority—according to Flower, 75 per cent.—belong to the subcoracoid variety. The other two varieties of anterior dislocation, the intracoracoid and subclavicular are very infrequent. In attempting reduction the following methods should be used and in the order given.

1. *Direct Reposition.*—This is one of the oldest methods in use. The surgeon places his fingers beneath and to the inner side of the head of the humerus with thumbs on the acromion process and attempts to press or pull the head of the bone into place. Anesthesia may or may not be necessary. It often succeeds in recent cases with slight muscular contraction and with the head of the bone very slightly displaced.

2. *Extension and Counterextension.*—This is also one of the oldest methods, but one which I believe is not appreciated at its full value. My attention was especially attracted to this method by reading an article by Stimson about two years ago in which he reported ten cases successfully treated, and in no case was it necessary to continue the extension longer than six minutes. Stimson advised the use of a canvas cot with a hole cut in it large enough to let the arm come through. The patient reclines on the cot with his arm projecting through the hole and a weight of about ten pounds attached to the wrist. The method was applied as follows in my cases:

With the patient in the dorsal position, place a folded sheet in the axilla of the dislocated arm and let the ends extend diagonally across, above and below, the opposite shoulder where they are held by an assistant. The surgeon flexes the

* Read at the meeting of the Association of Military Surgeons of the United States, at Boston, May 19, 20, 21, 1903.

forearm on the arm, to relax the biceps, takes hold of the arm with both of his hands just above the elbow and makes gentle, steady traction, at first in the line of the displacement, but as the traction increases, the arm is carried away from the side to an angle of about 45 degrees. The traction is continued, not too strongly, but just enough to make the muscles tense. An assistant should be ready to relieve the surgeon when he becomes tired, as he is apt to do in two or three minutes, and the change should be made without relaxing traction on the arm. In a short time, from one to six minutes, you gain the confidence of the muscles by the gentle steady traction, the spasmodic contraction ceases, the muscles relax and the head of the bone slips into place.

While this method is one of the oldest in use for the reduction of dislocations of the shoulder, there are certain features which, if not new, do not seem to be fully appreciated; namely, the importance of using *gentleness* with *persistence* and no great degree of force, and of keeping up the traction several minutes or until the muscles are tired out.

It is doubtful if this method is of much value in old cases. I have tried it in only two old cases, one a subclavian dislocation of eighteen days' standing, in which a number of attempts at reduction had been made both by laymen and physicians. I tried the traction method for ten minutes while the patient was under the influence of ether, without success, and reduction was finally effected by Kocher's method of manipulation. The other will be reported in the latter part of this paper.

This plan especially appeals to me and seems worthy of trial because: (*a*) It is free from pain; (*b*) it does not require anesthesia; (*c*) it is perfectly safe in recent cases; (*d*) it can be used by the general practitioner who may hesitate to attempt more complicated methods; (*e*) it does not lacerate or injure the tissues and thus interfere with the success of other methods which may be attempted; (*f*) it succeeds in the large majority of cases. During the last two years my assistants and myself at the Emergency and Georgetown University Hospitals have used this method in about 15 cases of recent dislocation with only two failures.

3. *Kocher's Method.*—This is probably the best method of manipulation and should be tried if *direct reposition* and *extension* and *counterextension* fail, but it is painful—usually requiring anesthesia, and in unskilled hands may result in considerable injury to the tissues. It consists of three steps: (*a*) Flex the forearm of the affected side to a right angle with the arm, press the elbow to the side, and rotate the humerus outward by carrying the forearm around until it stands directly out from the side. Unless the humerus rotates outward without difficulty, this method will fail. In some cases it may be made to rotate by making traction in the long axis of the arm. (*b*) Still holding the forearm at right angles to the body, bring the elbow forward or forward and slightly inward until the arm is horizontal. If the head of the bone does not slip into place during the second step, make (*c*) internal rotation by placing the hand on the opposite shoulder and lowering the elbow into position.

4. *Arthrotomy.*—If all three methods given fail in spite of anesthesia, the dislocation should be reduced by arthrotomy, provided the circumstances permit the performance of an aseptic operation. The methods by using the foot, knee, or fist in the axilla are not to be recommended on account of the danger to the axillary vessels, to the circumflex and posterior thoracic nerves, and even to the bones themselves—the humerus or ribs. I have in two cases fractured the ribs of patients with a moderate degree of force—using the fist as a fulcrum in the axilla.

The following case shows the impossibility of reducing some cases of dislocation without arthrotomy:

Case.—J. R., white, male; aged sixty years; farmer; native of Virginia, fell down a flight of stairs January 20, 1903, striking his left shoulder against the doorpost and causing a subcoracoid dislocation. A physician was called and attempted reduction with the foot against the side, by binding the arm to the side over a ball in the axilla, using anesthesia but without success. March 21, two months after the injury, he applied for relief, as he knew there was something wrong with the shoulder. The deltoid was wasted, the acromion prominent, the shoulder joint stiff and the patient suffered considerably from pain in the arm and hand. The head of the bone could be felt beneath the coracoid process. Under ether all methods were tried without success—direct reposition—extension and counterextension, Kocher's method, circumreduction, extension upward, and even with the foot in the axilla. The head of the humerus rotated outward in Kocher's manipulations but reduction could not be effected. An incision was made over the glenoid cavity from the anterior portion of the acromion process down the shaft of the humerus. Bony material was found occupying the glenoid cavity and was at first thought to be new bone but after dissecting it out and examining the humerus, it was recognied as the detached greater tuberosity. Adhesions existed around the margin of the fragment and the glenoid cavity beneath was found smooth and unchanged. Reduction was then easily effected by pressure in the axilla with adduction of the arm.

The wound was closed without drainage; recovery was uneventful and the patient was discharged March 30, nine days after operation. The patient expressed great relief from removal of pressure on the nerves in the axilla.

A Peculiar Action of the Roentgen Rays.—After having subjected a number of rabbits and guinea-pigs to the influence of the Roentgen rays for a number of hours on successive days, A. SCHÖNBERG (Münch. med. Woch., Oct. 27, 1903) was astonished to find that all the animals had become sterile. The general health and sexual vigor were normal, but spermatozoa were absent.

THE MORTALITY OF DIPHTHERIA IN PRIVATE PRACTICE UNDER THE ANTITOXIN TREATMENT.

BY JOHN ZAHORSKY, M.D.,
OF ST. LOUIS, MO.

IT is generally understood that the ordinary practitioner depends on his own results more than general statistics in estimating the value of a remedy. The published reports of the death-rate of diphtheria under the antitoxin treatment, while giving the opponents of the serum treatment a good field for controversial athletics, really are the least important in convincing the average practitioner. The physician conscientiously tries the antitoxin in a series of cases, his results are so much better than on any other treatment, and henceforth a little debate on the relative value of certain statistics gathered from hospitals and foundling asylums, makes no impression on his convictions.

Some months ago, in studying the mortality statistics given by recent authorities, I felt convinced that the figures are far in excess of the death-rate of diphtheria in private practice. Thus, for several years I have not had a single death, and in speaking to other physicians I was informed also that their death-rate was almost nothing.

I resolved, therefore to collect a few statistics among the physicians of St. Louis. I wrote to about one dozen physicians, who, I knew, had large practices among children, and who, I was sure, were ardent advocates of the antitoxin treatment, and used it promptly in every case. I was also assured that these gentlemen took pains to get a good serum and used it in sufficient doses. The answers really surprised me.

As the first two years of the antitoxin treatment was really in the experimental stage, the inquiry related to the last five years (1898-1902). But before giving these figures, it might be profitable to notice briefly some of the statistics on this subject.

	Per cent.
American Pediatric Society's Collective Investigation, mortality	13.7
Siegert (Jahrb. f. Kinderh., 1900), mortality	16.4
Spolverini (Il Policlinico, 1900), mortality	16.
Report of Health Department, Chicago, 1901, mortality	6.8
Report of Mass. State Board of Health, 1900, mortality	10.4

Various reports from Health Officers in England and Germany give the average mortality as about 15 per cent. Of course this includes all cases, in hospitals, asylums, moribund cases, and cases in infants of low vitality.

The collective investigation of the American Pediatric Society was made while the use of the serum was still in the experimental stage.

In the following table I give the number of cases treated by the physicians, who kindly responded to my inquiry. It should be understood that these patients were treated by the physicians from the beginning, and do not include moribund cases seen in consultation.

	No. Cases.	Deaths.
Dr. B. Bribach	150	1
Dr. H. A. Auler	627	7
Dr. E. W. Saunders	220	0
Dr. L. H. Behrens	20	0
Dr. M. J. Hopkins	38	0
Dr. E. W. Eberlein	61	5
Dr. W. S. Barker	250	7
Dr. G. M. Tuttle	60	3
Dr. J. C. Falk	80	1
Dr. W. L. Johnson	17	0
Dr. M. J. Lippe	32	0
Dr. John Zahorsky	55	0
Total	1,610	24

Mortality, 1.5 per cent.

Instead of 10 or 15 per cent., the death-rate in private practice should be not over two per cent. This includes laryngeal cases, many of which were intubated.

Dr. Bribach's only death was in a young infant with laryngeal diphtheria, the tube had been expelled and the infant was considered almost well, but the parents failed to notify the doctor when the stenosis appeared again.

Dr. Auler reports that several of his cases were practically moribund, and really should not be counted in. Out of 27 laryngeal cases treated with antitoxin and intubation, he lost only two.

Dr. L. E. Newman writes that in an extensive family practice, he has not had a single death since he uses antitoxin.

Dr. E. M. Senseney was among the first to use the serum in this city, and has had no death from this disease since.

Dr. E. W. Saunders feels that no patient suffering with diphtheria should die. A death means an error in technic, and not in the inefficiency of the serum treatment. In every suspected case he at once injects antitoxin and gives pilocarpine internally. He insists on a reliable serum, and the initial dose should be large enough to certainly neutralize all toxin in the blood and all that may be formed in the next few days.

From this correspondence I gather that, while these physicians have full confidence in the antitoxin curing diphtheria in a child who has an average constitutional resistance to disease, they admit that certain errors may be made, which may here and there cost a life.

The following are some of the common mistakes which may end disastrously:

(1) A diagnosis of simple tonsillitis is made and the patient is not seen for several days, when a severe case of diphtheria is found; (2) an insufficient dose of antitoxin is injected; (3) a worthless serum is injected, one either too old or prepared by an unreliable manufacturer; (4) a diagnosis of simple laryngitis is made in a primary laryngeal diphtheria.

Dr. Bribach makes it a rule to inject antitoxin at once in every case in which he cannot with certainty exclude diphtheria. He has had only one

death in five years and this he attributes to the carelessness of the parents.

While these reports are so gratifying, many deaths from diphtheria occur in St. Louis. I have been consulted in three moribund cases treated by physicians who had not made the diagnosis, or, at least, did not use the serum. Another case was given up by the attending physician (who did not believe in antitoxin), but was still saved by intubation and antitoxin.

Dr. Lippe related to me that he saw one child dead and the other dying in a family where a quack was in attendance.

I do not believe these statistics are singular, for I believe they can be duplicated anywhere, where physicians believe in the efficacy of diphtheria antitoxin and know how to use it.

MEDICAL PROGRESS.

MEDICINE.

A New Test for Bile in the Urine.—Since the usual bile-tests have proven very unreliable in the hands of A. JOLLES (Deutsch. Arch. f. klin. Med., Vol. 78, Nos. 1 and 2), the following one is recommended: Ten cubic centimeters of urine are mixed in a test-tube with 2 to 3 c.cm. of chloroform and 1 c.cm. of a 10-per-cent. solution of borium chloride. The mixture is then centrifuged, the fluid above the chloroform and precipitate poured off, and the tube filled with distilled water, shaken and centrifuged a second time. In case of dark-colored urines this is repeated a third time. After the water is decanted, the chloroform and precipitate are shaken with five cubic centimeters of alcohol and then two or three drops added of an iodine solution, which is prepared as follows: 0.63 gm. of iodine and 0.75 gm. of corrosive sublimate are each dissolved separately in 125 c.cm. of alcohol, poured together, and then 250 c.cm. of pure hydrochloric acid added. In the presence of even faint traces of bile, a distinct green color is obtained. The reaction can be hastened by placing the test tube into hot water for a few minutes. Indican or hemoglobin do not interfere with the reaction. The presence of one-tenth milligram of bilirubin in 100 c.cm. of urine still gives a positive reaction.

Influence of Water on Nephritis.—In acute and chronic nephritis, L. MOHR and C. DAPPER (Zeitsch. f. klin. Med., Vol. 50, Nos. 5 and 6) have found that a moderate restriction of water (up to 3 pints daily) will often influence the body favorably, so that the more energetic withdrawal of fluids will have a more pronounced effect upon the edema later on. The same observation may be made in cardiac cases. The elimination of nitrogenous principles and of phosphoric acid is not interfered with by this procedure unless the water is reduced to 40 ounces or less. Where it is imperative to give such small amounts, the system should be washed out occasionally by more liberal quantities. The amount of albumin in interstitial nephritis usually increases somewhat with deficient fluid, but this is of no account, being only a temporary phenomenon.

Intestinal Syphilis.—A rare case of primary intestinal syphilis of almost certain diagnosis came under the observation of C. GUTMANN (Zeitsch. f. klin. Med., Vol. 50, Nos. 5 and 6). An infection was denied and there were no other signs of lues, so that the patient was considered tuberculous. At autopsy, however, the ulcers lacked all the characteristics of tuberculous lesions. They were seated in pairs or larger groups throughout the small intestine, but involved the lower portion of the jejunum more than any other part. There was a marked tendency to spread around the entire circumference of the gut in the form of a ring, with subsequent cicatrization and stenosis. The infiltration was marked and tumor-like, and the base smooth. Microscopically the lesions did not impose as a primary ulceration, but as a cell-infiltration, beginning in the upper layers of the submucosa and followed by necrosis extending into the inner muscular layer. What made the diagnosis almost certain was the presence of endarteritis in the smaller mesenteric vessels. During life the most marked symptoms were uncontrollable, diarrhea, intermittent temperature and rapidly advancing cachexia.

A New Reaction for Sugar.—In some urines which imperfectly reduce Fehling's and Nylander's solutions, and do not ferment or turn the plane of polarized light, it is possible to demonstrate the presence of pentose by means of orcin and hydrochloric acid. M. BIAL (Zeitsch. f. klin. Med., Vol. 50, Nos. 5 and 6) finds that glucose and other sugars with six atoms of carbon will also give this reaction if a few drops of sesquichloride of iron solution are added before boiling. If the bluish green precipitate is dissolved in amyl alcohol and then examined with the spectroscope, the bands will, however, be different. This discovery may be of value in distinguishing between glucose and glucosamin, which, both form the same osazone when treated with phenylhydrazine.

Symptoms of Open Ductus Botalli.—The most usual cause of persisting communication between aorta and pulmonary artery is premature birth. Owing to general weakness and insufficient respiratory movements, the sudden change in respiration which is necessary to obliterate the duct, does not take place. There is frequently also a history of some constitutional disease on part of the parents, such as alcoholism. The symptoms often amount to no more than a moderate cyanosis and the prognosis is generally fair. According to A. BITTORF (Münch. med. Woch., Oct. 13, 1903), dulness to the left of the sternum, at the level of the second or third rib, due to dilatation of the pulmonic artery, is almost pathognomonic. Over this area there is often a systolic pulsation with a blowing systolic murmur, and an accentuated second sound. The murmur may also be heard over the apex and is not transmitted into the carotids and the pulse need not show any abnormalities. Frequently there is also an open foramen, but it is generally impossible to diagnose this during life. The Roentgen rays generally establish the diagnosis beyond doubt.

A Fatal Case of Poisoning by Quinine.—The literature of quinine poisoning being very scanty and a fatal case almost unique, the following instance should prove of interest. It is reported by R. H. QUILL (Jour. Royal Army Med. Corps, Oct., 1903). The patient swallowed, evidently with suicidal intent, a quantity of sulphate of quinine in solution, amounting to about 240 grains. Within two minutes the symptoms of poisoning came on, beginning with retching and vomiting, which was favored by the prompt administration of an emetic. This was soon followed by almost total unconsciousness, slow and labored respiration, and a barely perceptible pulse, which, under very active stimulation, would return for a time only. A few hours later convulsions affecting mainly the lower extremities came on, and this was soon followed by death. Post-mortem examination showed the blood fluid and very dark in color. The brain was congested and the lateral ventricles were full of serum. The liver, lungs and kidneys were also congested, but otherwise healthy. There was no inflammatory or corrosive appearance of the

mucous membrane. The author believes that if the stomach pump had been efficiently used within a short time after the accident, it is very possible that the fatal issue might have been avoided.

Cordite Eaters.—A recent communication on this subject is published by J. W. JENNINGS (Jour. Royal Army Med. Corps, Oct., 1903), relating to his experiences in the South African campaign. He observed personally a number of cases where the men ate one or more strands of the cordite, which they took from their cartridges. These strands measure about 1¼ inches in length and 1/28 of an inch in thickness. The symptoms are similar to those produced by amyl nitrite, the headache being extremely violent. When taken with beer or tea, cordite produces heavy sleep, followed by stupor lasting from five to ten hours. It is difficult to awaken the patient from this deep sleep and the dulness continues for some time. When taken in solution an immediate exhilarating effect results, inciting almost to demoniacal actions. This lasts for several hours, and is then followed by a deep sleep. The author does not believe that the habit is at all universal in the army, and the symptoms and effects are sufficiently forcible and unpleasant to prevent any but the most depraved resorting to either as a cerebral stimulant or sedative.

The Association of Heart Disease with Tabes.—There are many who do not regard endocardial lesions as of great importance or as a complicating factor when associated with tabes. B. F. STAHL (Am. Med., Nov. 14, 1903) believes that more emphasis should be laid on this condition and that it should command more consideration as regards treatment. Among 24 cases examined at one time, in the Philadelphia Hospital, cardiac lesions were present in 19, and the radial artery was appreciably affected in all but three cases. Only two of the patients had normal heart sounds in all the areas, 10 had accentuation, weakening or blurring of the sounds, and 12 presented clinical evidence of valvular disease. In 19 cases, syphilis was admitted or probable. The author believes that the intimate relationship existing between syphilis and tabes and the pronounced circulatory changes induced by the former, make it reasonable to regard syphilis as the cause of the large percentage of cases of valvular heart disease, which we find associated with tabes.

Thyroiditis as a Complication of Anginæ.—Four cases, in which there appeared to be some direct connection between these two conditions, are reported by W. LUBLINSKI (Berl. klin. Woch., Oct. 12, 1903). They presented the symptoms of a moderate angina, with little rise of temperature. After the latter had almost declined, a sudden rise again occurred on the fifth or sixth day, accompanied by a painful, acute swelling of the thyroid glands. The pressure symptoms were not marked, but there was a considerable acceleration in the pulse rate. The swelling disappeared gradually in from two to eight weeks. In other cases, previously reported, suppuration always took place, and its absence in the author's cases may be explained by assuming that the swelling was of a rheumatic origin. The most relief was afforded by ice applications, followed later on, when the acute process had subsided, by a mild iodine ointment.

"Orthotic Albuminuria."—This term has been applied to that form of cyclical albuminuria which depends on the change of position from the horizontal to the vertical or vice versa. O. JACOBSON (Berl. klin. Woch., Oct. 5, 1903) has made a careful study of a number of such cases and has just published the results of his observations. He believes that there is an intimate connection between this form of albuminuria and that associated with the time of puberty, in which a hereditary neurotic tendency plays an important rôle. Almost all the cases he saw were about the age of puberty, presented a pale, flabby appearance, and in a number of instances were markedly neurasthenic. One of the main factors in determining the diagnosis was the fact that albumin was entirely absent in the urine voided during the night. It seems that the albumin invariably appeared after the patient was up, and subjected to a certain degree of fatigue or exertion. He observed, however, that continual standing or slovenly walking was more apt to call forth this symptom than walking undertaken with a certain amount of interest and energy. He explains the sudden appearance and disappearance of the albumin in the urine by assuming that the easily disturbed nerve stability in these patients produces varying changes in the secretory function of the epithelium of the urinary tubules.

Relation of the Status Lymphaticus to Sudden Death.—A valuable addition to the recent literature of this subject is the paper just published by GEO. BLUMER (Johns Hopkins Hosp. Bull., Oct., 1903). His views are based on nine cases of sudden death occuring in infancy and childhood, and on the study of the available literature, especial attention being paid to the histology and bacteriology of the condition. He concludes that the status lymphaticus is a definite pathological entity and is probably associated with, if not due to, a condition of intermittent lymphotoxemia. It may be associated with sudden death, probably as a result of lymphotoxemia alone in some cases, or as a result of the action of toxic, physical or psychic injuries, which are rendered much more powerful than usual by the predisposing action of the lymphotoxemia. In some cases the sudden death is undoubtedly mechanical and due to asphyxia from pressure of the enlarged thymus on the trachea.

Cause and Treatment of Various Kidney Conditions.—In a discussion of several clinical features which result from kidney and genito-urinary lesions, W. H. THOMSON (Med. Rec., Oct. 17, 1903) has given some very practical hints in regard to therapeutics. He suggests that the high tension pulse of nephritis is due to an agent in the blood, similar to, if not, adrenalin, which causes kidney shrinkage and diminished urea excretion. The effects upon the circulatory apparatus in nephritis are exactly similar in kind to those caused by the intravenous injection of adrenalin. The possibility of the suprarenals being stimulated to increased secretion in cases of chronic nephritis is offered. Besides the increased blood pressure, investigation has shown that the suprarenal extract has a wonderful effect in causing a shrinkage of the kidney itself and naturally a diminution of urea excretion. In the treatment of cases manifesting extreme arterial tension and overacting heart when the ordinary vaso-dilators prove inefficient, as they do so frequently, the tincture of aconite in doses of five minims every three or four hours is often very beneficial, the urea at once being very much increased. He also describes a class of cases among women especially manifesting the symptoms of some nervous disorders and usually diagnosed as neurasthenia or hysteria. No organic lesions are found, but if the urine is carefully examined the excretion of urea will be found to be far below the normal. It is believed that digestive derangements are frequently the cause of this inhibition of urea elimination, just as normally the intake of food stimulates the excretion of urea. They usually feel worse in the morning, and the pulse is of low tension. It is believed that a bi-weekly dose of blue pill alternating with the pulv. glycyrrhizæ Co., and the steady administration of intestinal antiseptics, along with the regulation of the diet will in time relieve them of their multitudinous ner-

vous symptoms, and more surely than the nervines. Among the intestinal antiseptics he has found the best results from ten-grain doses of sodium or ammonium benzoate, with the same of phenol bismuth, or salve, with castor oil in shellac-covered capsules. A case of chronic spermatorrhea in a married man, resisting all methods of treatment ordinarily employed, is described. He had become almost a nervous wreck when a T-bandage was applied and a firm cylindrical pad two inches in diameter and covered with chamois skin was placed against the perineum and held in position by the bandage. The improvement was very marked in this instance, and the same method of treatment is recommended for the annoying cases of too frequent nocturnal emissions.

Treatment for Wryneck.—The etiology of this condition is by no means clear in the majority of cases, but organic causes are sometimes found and require appropriate measures. In the idiopathic cases we frequently express our ignorance by saying that the torticollis is due to irritation of the nuclei of the neurons. L. K. HIRSHBERG (Maryland Med. Jour., Oct., 1903) reports a method of treatment which he has employed in several idiopathic cases with excellent results. The Faradic current was applied daily for five minutes by placing the positive electrode over the wrist and applying a roller negative electrode over the healthy sternomastoid and upper fasciculus of the trapezius on the unaffected side. An internal treatment of two drops of liquor potassii arsenitis was continued three times a day during a considerable period. Improvements in each case began at once, but it required some time before complete recovery was reached.

Fat in Blood and Organs.—Fat is a normal constituent of the blood and organs, even in stillbirths, where no food has been taken into the alimentary canal. According to T. RUMPF (Virchow's Archiv, Vol. 174, No. 1), it is very difficult to determine the normal figures for the blood, since the amount is much larger after a meal than before, and the body possesses no organ which regulates the amount like the liver does for sugar. Diabetic coma does not seem to be accompanied by excessive lipemia, but high figures were obtained in arteriosclerosis and low ones in interstitial nephritis and tuberculosis. The heart and peripheral muscles may contain up to 16 per cent. of the dry residue, the liver 19.6 per cent., but in alcoholism and advanced tuberculosis as much as 56.6 per cent. was obtained. In the kidneys, the fat is increased in congestion and interstitial nephritis; for the spleen and brain no constant figures could be obtained.

Croupous Pneumonia Complicated by Pneumococcic Endo- and Pericarditis.—Pericarditis and endocarditis, complicating pneumonia, are seen so rarely that some of the authors attach no importance to such a complication. In fact, out of a grand total of 5,738 cases of croupous pneumonia, Von Brach hardly found .2 per cent. and .5 per cent. of them complicated by endo- and pericarditis, respectively. There occur undoubtedly some epidemics of pneumonia, in which this complication is more frequent than in others; then pregnancy predisposes to it, as well as preceding valvular disease. The causative factors of cardiac implications are most frequently the Talamon-Fränkel pneumococci, at times also the streptococci, and rarely also other microorganisms. The prognosis, always serious, and frequently fatal, becomes very grave when purulent meningitis supervenes upon the endocarditis. The case reported by SACHATZKY (Roussky Vrach, Oct. 4, 1903) was that of a croupous pneumonia in which, on the third day after a typical crisis, the patient began to have chills followed by a temperature of 40° C. This was accompanied by a gradually increasing weakness and paleness of the skin entirely out of keeping with such a temperature. Examination on the fifth day elicited a much wider area of cardiac dulness than was normal, and the appearance of a peculiar systolic murmur at the apex, and somewhat variable at the base and aorta. To these symptoms there was soon added a distinct friction sound of a pericardial nature. The pulse grew more and more frequent, and from dicrotic became hyperdicrotic. There appeared later on undoubted symptoms of pulmonary infarction, such as cough and mucus tinged with blood, and bronchial breathing, under the fifth and sixth ribs along the right mammary line. Later the urine was found to contain some blood and albumin which led to the suspicion of an infarction in the kidneys. Patient died on the fourteenth day of the disease from cardiac paralysis. The findings at the autopsy substantiated fully the antemortem clinical diagnosis.

A New Gastric Phenomenon in Migraine.—As the result of careful clinical observation, MANGELSDORF (Berl. klin. Woch., Nov. 2, 1903) claims that there is a regular and well-marked increase in the size of the stomach during an attack of migraine or epilepsy. He determined the outline of the stomach by percussion, after inflating the same when necessary, both during and after the attack, and controlled these findings by observations made during the intervals when the patient was well. This dilatation includes all parts of the stomach and subsides after the attack. In the course of time atony of the stomach results, followed later on by a variety of gastric and intestinal disturbances. Among 409 cases afflicted with migraine, only one presented a normal condition of the stomach, as regards this phenomenon, and in this instance the trouble had only been present a short time. Examination of a large number of patients suffering from other nervous or cerebral disorders failed to disclose this symptom, with the exception of those which were the subjects of idiopathic epilepsy. He does not attempt to explain this phenomenon, but notes that in all these cases where special attention was directed to treating the gastric atony, the migraine rapidly improved.

Cause of Milky Ascites.—While studying chylous ascitic fluid, J. JOACHIM (Münch. med. Woch., Nov. 3, 1903) was unable to detect any fat to account for the milkiness. He then subjected the proteid constituents of the fluid to an accurate analysis and found it rich in globulins. By solutions of ammonium sulphate of different saturation, the globulins were separated into euglobulin and pseudoglobulin. From the latter, lecithin could be split off, and it is probable that the loss of transparency is due to this combination.

Alkaptonuria.—In the condition known as alkaptonuria the urine turns brown rapidly when exposed to air and upon the addition of alkalies, while chloride of iron will give a green color and ammoniacal silver, and Fehling's solutions are reduced. It is not difficult, however, to distinguish such urine from diabetic urine, as it does not reduce bismuth nor turn the plane of polarized light, or ferment. The condition is generally congenital, the parents of the patients are often close blood connections, and there seems to be a close relation to that pathological lesion known as ochrinosis, marked by a dark pigmentation of the cartilage, and occasionally of the interna of the aorta and endocardium. L. LANGSTEIN and E. MEYER (Deutsch. Arch. f. klin. Med., Vol. 78, Nos. 1 and 2) find that the acids which occur in the urine are derived from the tyrosin molecule of the ingested albumin, and also from the albumin of the organs, since with proteid-free diet the peculiarities of the urine did not disappear.

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THE BREEDING OF GIANTS.

FRANCE, who is nothing if not hysterical, is now laboring under the throes of a severe attack of nervous dyspepsia over the problems of national decay and race suicide. This is merely an exacerbation of the seizure of the last year, when the admitted degeneration of her lower classes was attributed to the deleterious effect of the constant use of adulterated cordials and synthecated aperitifs—which, according to their own statistics, seemed to be filling their jails with degraded criminals and their insane asylums with duly qualified patients. This, however, does not account for the decrease in her birth-rate, which appears to have been due largely to the proverbial ounce of prevention, and which, when associated with what might be called domestic physiology, only goes to show that a little knowledge is a dangerous thing, particularly when it affects a national issue.

The remedies that have been prepared to arrest this increasing degeneration are numerous, and their Chamber of Deputies has been flooded with bills, all of which are frankly ingenious and some of which are gallically unique. Thus one learned legislator, who, though on pleasure bent seems, like John Gilpin, to be possessed of a frugal mind, proposes the offering of prizes for large families, and the remission of taxes to the happy fathers of many sons—the deficit of revenue thus occasioned being made good by an increased levy on the unblessed paterfamilias and lonely bachelors. Another interesting suggestion is that unmarried men shall be ineligible for official positions under the government, or municipalities, while the latest bill introduced, provides that married men and the fathers of children, shall be exempt from military service, and that the French army shall be limited to bachelors only.

All these measures, however, even if they were successful, would only tend to enlarge the number of births, while they would not improve the virility of the nation, or increase the strength of the individual. It is a question of quality rather than quantity, and at the best, the results of such legislation would only serve as an object illustration to the address of Dr. E. Benjamin Andrews, lately delivered to the Delta Epsilon Society, in which he begged President Roosevelt "to take early occasion to amend his plea for swelling the census, by urging quality of population as more of a desideratum." This, however, seems to really be one of the things that they do better in France, for some time since, Count Alfred de Pierrecourt left a legacy of $2,000,000 to his native city of Rouen to pay the expense of the propagation of giants. The will was contested by his heirs, who naturally enough did not see the necessity of having giants on the earth in these days, particularly when they were to be bred, raised, fed and clothed at their personal expense. The courts, however, sustained the will to the extent of endowing the Brobdingnagian experimenters with a quarter of the estate, so that an institution has been established with an income of $500,000, under the supervision of the municipality, for the culture of giants and the production of monstrosities.

The trustees are to search the four corners of the globe for men and women of large stature, and are to pair them off in couples and place them in the homes on a farm near Rouen. Neither race nor language is to be taken into consideration, and the fact that Bridget has never seen Hans has nothing to do with the case. Personal predilection does not enter into the spirit of the scheme, and she is to be torn from her native land with hardly enough of the soil left clinging to the roots to favor the transplantation, provided only that she has the necessary girth to balance the stature of the opposing and unknown party of the second part.

That there are difficulties in the path of the conscientious trustees is apparent. Wild birds will seldom sing in cages, and the production of giants, while you wait, is a new field of industry. Months waxed and moons waned, but Bridget had not laid her lofty head on Hans' towering shoulder while whispering confidential somethings in his vast and ponderous ear, and there were no tidings, as Nestor says, "Of the baby figure of the giant mass of things to come."

France was in despair. The importations were a failure, and Ribot's law of like begetting like, forbade the hope of any successful experiments with the domestic article. At this juncture came the announcement from America—like a sunbeam through the vapor—that one of the professors at the University of Chicago had been fortunate enough to discover the food of which giants are made, and that he had succeeded by its use in doubling the size of white rats. France went mad. The medical societies discussed it, the boulevards rang with its echoes and the journals were full of "M. le bon professeur Americain, Esquire, M.D., de Chicago," who would raise the glory of France until it was "six foot one way and five foot the other, and weighed four hundred pounds."

That their confidence is not misplaced and that their expectations are reasonable seems true. If the "professor" has done this to the rats, what could he not accomplish with a lot of French sansculottes, if their bones are as yielding as the conscience of Gaston, and their skin as flaccid and lax as the morals of Alphonse?

As to the discoverer of this food, his path lies open, free and fair for him to France. Americans are already large enough, and it is a pity to waste this "raising powder" on rats—be they white or gray. *A bon chat, bon rat,* and we have "foods" in plenty. Foods for babes, "foods for brain workers," foods for every sort and condition of men, and for each individual function that dwells therein.

"To-day no credit comes to you
For being noble, wise or great.
The advertisers say it's due
Entirely to the 'foods' you ate."

JEAN ASTRUC, A FORGOTTEN MEDICAL WORTHY.

IT is probably the fortune of very few medical men to acquire enduring fame, and yet to be forgotten in their own profession. But such has been the fate of Jean Astruc. The name of Astruc is indelibly associated with the history of the higher criticism of the Hebrew scriptures, while his medical writings, which brought him much contemporary fame, are buried in our medical libraries among the forgotten tomes of the eighteenth century. The subject should not be without interest in the present age, which shows a growing curiosity to resurrect the names of the medical worthies of the well-nigh forgotten past.

Astruc was a French physician of great learning at a time when physicians were still renowned for their wide acquaintance with letters. He was born in 1684, studied at the University of Montpellier, and eventually held chairs successively at Toulouse, Montpellier and Paris. His teaching attracted many students, and his writings were voluminous. His chief work was *De Morbis Venereis libri sex*—a work which was translated into English and enjoyed a great vogue. He also wrote on obstetrical and medical subjects, and died at the advanced age of eighty-two years, after a life devoted to letters and to medical science.

All this would not, however, have preserved the name of Astruc, and it is one of the curiosities of literature that this learned physician owes his place in the realm of letters not to the labored treatises which he contributed to medical science, but to a small monograph which had no relation to medicine, and which its author probably regarded as among his least important works. This inconspicuous book was entitled *Conjectures sur les memoires qui ont servi â Moise pour écrire la Genése*—a book of which it may be said that it was pregnant with an idea of almost unsurpassed importance in modern literary criticism.

In this epoch-making book the author pointed out the fact that the cosmogony in the first two chapters of the book of Genesis was in two distinct accounts, written by different authors, and that the author of the first account (Gen. 1—1 to 11—3) always uses the Hebrew word *Elohim* for the deity, while the author of the second account (Gen. 11—4 to 11—25), always uses the word *Jahveh.* This hint or suggestion of such seemingly little importance, was subsequently recognized as the key to unraveling the composition of the earlier Hebrew scriptures, and has been adopted by all subsequent scientific critics in that most fruitful analysis, which is known as the Higher Criticism. Astruc had detected, in other words, the criteria by which the separate records of the *Elohist* and the *Jehovist* could in a large measure be recognized. The learned German scholar, Wellhausen, has said of Astruc that

he had the merit of opening the true path of this investigation of the Hebrew scriptures.

While this subject of Biblical criticism is in one sense outside the limits of medical science, it is, in another sense, of interest to all physicians who care to keep informed about the methods of science as applied to the unraveling of old documents which have had such a stupendous influence in opposing a true scientific conception of the universe. Moreover, the fact that one of the pioneers in this research—and one who contributed the most fruitful method—was a member of the medical profession, makes this interest all the more natural and inevitable. Astruc builded better than he knew when he turned from studying venereal diseases to study the composition of the book of Genesis. It is indeed a strange thought that this accomplished French physician of the old régime should have contributed, out of the fulness and wideness of his literary wealth, a small book in Hebrew criticism which will probably keep his memory green long after his venereal writings are forgotten.

ECHOES AND NEWS.

NEW YORK.

Plans for New Willard Parker Building.—Plans have been filed with the Department of Buildings, Manhattan, for a new six-story and basement laboratory and dormitory at Sixteenth street, east of Avenue C, for the use of the proposed new Willard Parker Hospital. The fifth floor will contain a library, and two floors are to be devoted to dormitories. The building will have a façade of ornamental brick, and is estimated to cost $100,000.

New Hospital for Staten Island.—St. Vincent's Hospital, a branch of St. Vincent's Hospital in Manhattan, located at the corner of Bard and Castleton avenues, West New Brighton, S. I., was formally opened on Friday last. Judge Albert Reynaud, in the address of the evening, said the Sisters in charge will not consider either creed, nationality or condition. The first ambulance service Staten Island ever had will be maintained. The hospital contains forty-one rooms, and accommodates about 200 patients. Sister Clement Marie, who had been attached for forty-nine years to the main hospital in Manhattan, will be in charge of the Staten Island branch. The property around the hospital, 257 city lots, was bought for $35.000.

Endowed Beds for Post-Graduate Hospital.—New York Lodge No. 1, Benevolent and Protective Order of Elks, is about to endow in perpetuity, at an expense of $15,000, two beds in the Post-Graduate Hospital, at Second avenue and Twentieth street. The hospital agrees to place the beds in a private room, to give the lodge the right to say who shall occupy them, and also to give these patients verything they need without additional expense. The money is to be paid in installments within a period of eighteen months. There has been subscribed already $4,700. There are only 1,300 members in the lodge, which in the last thirty-five years has given $220,000 to relieve sickness and distress.

Stamping Out Consumption.—The Charity Organization Society Committee on the Prevention of Tuberculosis is again circulating an appeal for funds to be used in checking the ravages of consumption in this city. Among the special needs which will have to be supplied, chiefly by private initiative, the Committte places emphasis on the following: Private sanatoria should be provided for patients who can afford to pay a moderate amount, and they should also be endowed sufficiently to provide for absolutely free treatment in exceptional cases. Relief funds should be supplied for the relief of indigent consumptives in their own homes until sanatorium or hospital accommodations are provided, and for patients who, on competent medical advice, can safely and with advantage to themselves and their neighbors, be treated at home. There are some instances in which the payment of board in private families outside the city is advisable, and relief funds should be provided for this purpose, especially in the interval pending the enlargement of sanatorium and hospital accommodations. Special dispensaries or clinics for the treatment of patients living at home are desirable. The presence of persons suffering from various forms of tuberculosis in general dispensaries is objectionable in the interests both of themselves and of other patients. Seaside sanatoria for scrofulous and tuberculous children are also needed, to which teachers should be attached, so that the intellectual development of the children need not suffer. An agricultural colony is desirable, where cured patients discharged from the sanatoria may find outdoor employment for a time. The education of the public in the means of prevention, and in those facts concerning the cure and treatment of the disease which are of interest and of value to the general public, is one of the essentials to the stamping out of the disease.

The New Medical Inspector of Hospitals and Retreats for the Insane and His Duties.—The New York State Commission in Lunacy had the following law passed at the last session of the Legislature: "The commission in lunacy may also appoint a medical inspector, who shall be a well-educated physician, a graduate of an incorporated medical college, and who shall have had actual experience in an institution for the care and treatment of the insane. Such inspector shall receive an annual salary of $3,500 and all his actual and necessary traveling expenses incurred by him in the performance of his duties, which shall be audited and paid in the same manner as the other expenses of the commission. He shall, subject to the direction of the commission, visit and inspect the several State hospitals and other institutions for the insane which are subject to the supervision, visitation and inspection of the commission. He shall, subject to the direction of the commission, make an examination, so far as circumstances may permit, of the patients confined in such hospitals and institutions, especially those admitted thereto since his preceding visit, giving such as may request it suitable opportunity to converse with him apart from the officers and attendants. He shall perform such other duties as may be prescribed and directed by the commission."

In accordance with this law, Dr. W. L. Russell, first assistant physician at the Willard State Hospital, was selected from a list furnished by the Civil Service Commission of physicians eligible to be superintendents of State hospitals, and on October 1 duly appointed medical inspector.

The character of his duties will be seen from the following outline which has been sent to the twenty-five licensed retreats for the insane in the State: The Medical Inspector shall make visits to the licensed private retreats for the insane at least once in two months, and oftener when deemed advisable by the Commission.

The scope of his inspection and report will include the following points:

Name of retreat.

Licensed for how many patients?

Number of patients—male voluntary, female committed. Total.

Number and names of physicians.

Number and names of ordinary attendants.

Number and names of trained attendants, with name of school of graduation in each case.

Note general appearance of attendants as to dress, conduct and apparent qualifications.

Number of servants.

He shall see all the patients present, both voluntary and committed, reporting to the Commission the names of any requiring special attention.

He shall write in his report the names of patients admitted since the last visit and the diagnosis.

Inquire into the method of treatment of acute cases, and the facilities for the treatment of maniacal excitement in acute and chronic cases.

Ascertain character of restraint used, if any. Reasons for use of restraint. All restraint apparatus on the premises to be exhibited to the Inspector, who will make a list of the same.

Is seclusion used? Number and names of patients found in seclusion.

Reasons for seclusion.

Classification of patients. Are sexes sufficiently separated?

Ascertain the adequacy of fire protection and fire-escapes.

The Inspector should visit all parts of the premises, all rooms, wards, closets, attics, basements, kitchens, stables and outhouses, and report on the general condition of buildings, furnishings and grounds.

Examine into sanitary conditions: Water supply, sewage disposal, number of bath-rooms and frequency of bathing patients, number of water closets, cleanliness, ventilation and lighting of toilet rooms, condition of clothes rooms, condition of mattresses, pillows and bed linen, hydrotherapeutic apparatus.

Examine medical certificates, histories and registries of admissions, transfers, discharges and deaths. Read commissioners' book and note whether suggestions made therein have been carried out. Ascertain whether any scientific work is done, such as methodical examination of blood, urine, etc., and number of autopsies performed. Report on dietary, amusements and occupation of patients. Make a minute of new construction in improvements contemplated. Enter in commissioners' book a minute of the condition of the house and patients. His inspection of the fourteen State hospitals includes features similar to those noted above for the private institutions. The work of the Medical Inspector supplements the work of the lunacy commissioners, but does not in any way diminish their duties. They are still required to make their usual semi-annual visit to the hospitals, both private and public. The more frequent inspections by Dr. Russell will keep the Commission constantly in touch with the institutions under its charge, accelerate attention to repairs and betterments and tend to the better safe-guarding and welfare of the patients.

PHILADELPHIA.

Hospital Damaged by Fire.—A recent fire in the out-patient department of the Children's Homeopathic Hospital, Franklin and Thompson streets, damaged the building to the extent of $4,000. It threatened for a time to ignite the main structure and caused the removal to other wards of 25 children.

German Hospital Donations.—At the annual donation day of the German Hospital held on Thanksgiving Day, 5,000 patrons visited the wards. The donations aggregated $9,000 in cash and $2,500 in merchandise.

New Methods of Disinfection.—Measures to remove some of the objections to the present methods of disinfection and fumigation of smallpox premises have been provided for by Councils and will be put in force in a few weeks. Temporary buildings for the disinfection of persons found in houses with smallpox patients will be erected outside of the Municipal Hospital grounds, this doing away with the necessity of taking such people within the hospital enclosure. In those instances where facilities for such baths are contained in the houses, tablets of disinfecting materials will be supplied and the well persons allowed to take their baths in the house, going immediately to those parts which have been disinfected. This is, of course, possible only in large houses. Instead of taking clothing and bedding to the hospital for disinfection, two large portable disinfecting wagons are to be constructed. They will be taken to the doors of the infected house, the goods placed in them and disinfection accomplished by means of live steam and formaldehyde.

Report of State Board of Health.—An important feature of the meeting of the State Board of Health held at Pittsburg, November 27, was the annual report of the Secretary, Dr. Benjamin Lee. The larger part was devoted to the consideration of smallpox, of which there was during the year, in Pennsylvania, 6,504 cases and 503 deaths. The largest number occurred in Pittsburg, where there were 1,234 cases and 238 deaths. Dr. Lee directed particular attention to the inefficiency of maintaining ordinary hygienic conditions and personal cleanliness alone as a preventive of smallpox. The Board early in the present epidemic often received urgent appeals from physicians who feared the results if smallpox appeared among crowded settlements of ignorant foreigners, who live in filthy surroundings. It was found, however, that the disease did not spread among these foreigners, but among the enlightened Americans who were not vaccinated. Dr. Lee said that the prominent establishments in Pennsylvania for the manufacture of vaccine virus had been highly commended by the examining officials of the United States Public Health and Marine Hospital Service.

Epidemic of Typhoid Fever in Butler.—An extensive typhoid epidemic is at present prevailing in Butler, Pennsylvania. More than 1,500 cases out of a population of less than 13,000 have occurred and 30 deaths have occurred up to the time of writing this letter. The source of infection has been found to be in the water supply of the city. Heavy rains had destroyed the new reservoir and an old one had been used. Finally the filtration plant broke down and water was taken directly from the creek. Soon after this typhoid appeared. Four of the physicians of the city are down with the disease. Appeals for aid have been made to nearby towns and, unofficially, to Philadelphia. Dr. F. C. Johnson, assistant chief resident physician at the Philadelphia Hospital, was sent by Director Martin to Butler to determine the

conditions there and decide whether relief should be sent from this city. An extraordinary meeting of the State Board of Health was held in Butler immediately after their meeting in Pittsburg. Secretary Lee says that the epidemic is the result of the failure of physicians to make weeky reports of contagious diseases. The disease had been in progress for some time before the health authorities were cognizant of its extent.

Smallpox Continues to Increase.—Smallpox is rapidly taking on the proportions of an epidemic in this city. For the week ending November 28 the new cases numbered 70, and for the 48 hours following they numbered 40. The largest number of the cases are located in the sections north of Market street and west of the Schuylkill. The spread continues in spite of the extra precautions that have been taken during the month of November. Double quarantine, front and back, has been placed upon houses containing the disease and the interior subjected to several fumigations before removing quarantine. Upward of 300 cases are now under treatment at the Municipal Hospital, additional nurses and attendants being made necessary. The sixth case among the colored religious fanatics who refused vaccination occurred November 30.

The Control of Contagious Diseases.—The meeting of the Philadelphia County Medical Society, November 25, was devoted entirely to a consideration of the report of a committee appointed to suggest methods for the control of contagious diseases by the Municipal authorities. The report was presented by Dr. Alfred Stengel who stated that the committee had prepared it after investigations of the methods in New York, Boston, Baltimore, St. Louis and Chicago. Among the recommendations was one making the reporting of contagious diseases the duty of the household in which they occur. This should be done on postal cards furnished by the Board of Health and distributed by physicians. Physicians would still be required to report all notifiable diseases as heretofore. Among the new diseases to be placed on the notifiable list were mentioned measles, German measles, plague, anthrax, glanders, rabies, and tetanus. They suggested that physicians instead of householders should report cases of laryngeal and pulmonary tuberculosis. Another suggestion was that quarantine of cases of diphtheria should be removed after a period of two weeks from the time of clinical recovery without making cultures from the throat. This method might occasionally allow the escape of a contagious case, but if negative cultures are depended upon the quarantine law will often be evaded and the hardship of detention be enforced upon many people who are not capable of spreading the disease. The discussion of the report brought out many diverse opinions regarding the recommendations. Dr. A. C. Abbott raised the question of placarding houses, stating that the practice was an annoyance and was not of great service in keeping people away from such houses. Perhaps smallpox and plague placarding might be allowable, but there are perhaps better ways of managing even them. He would recommend a special corps of sanitary police for enforcing quarantine. Dr. Abbott thinks it is a mistake to recommend the clinical instead of a bacteriological test for the raising of quarantine of diphtheria patients. After a long and spirited discussion the report was referred back to the committee for revision. Director Martin stated that it was the desire of the Health Department to obtain opinions from the County Medical Society and the College of Physicians regarding the best methods of handling contagious diseases. When these were obtained the Department would try to enforce the recommendations as being those that were practicable. He stated that it was easy for executive departments to institute a set of regulations that were theoretically ideal and yet impossible to actually carry out. Hence he wishes the united opinion of the profession as to methods that can be carried out even though they be theoretically imperfect. When the physicians of the city unite on certain definite plans the department is ready to assist in putting them into action.

Medical Inspection of Schools in Philadelphia.—In June, 1898, a committee of the Public Education Association brought to the attention of the Board of Health the control obtained over contagious diseases in other cities by a careful inspection of what have proved to be the centers for the spread of contagion, the public schools. A resolution was passed on June 7, 1898, by the Board of Health, directing the 15 Assistant Medical Inspectors to visit one public school each day in their respective districts. This inspection commenced on June 16, and during the following winter, from October, 1898, to February, 1899, a period of 13 school weeks, a large number of contagious cases were found in the schools by the Inspectors. The John Bartram School, Mt. Moriah Lane and Greenway avenue, Fortieth Ward, furnished a test case for the system. In September, 1898, it was threatened with an epidemic of diphtheria. Of 13 cases in the ward, 11 had been attending that school. Investigation by the Board of Health showed that children from a certain house had been attending the school with "sore throats." The family being Christian Scientists, no physician had been called. Examination proved them to be suffering from diphtheria. An investigation of the absent list of the school developed 2 other cases of diphtheria. The school was at once fumigated, and daily visits of the Medical Inspector placed the school under surveillance until the disease had disappeared. In December, 1899, this Association went before Councils with a plea that the Health Board should be given funds to extend the inspections to all schools, both public and parochial, and should be given a corps of Medical Inspectors large enough to permit of daily visits to all of the 325 buildings of the public schools, as well as the 28 of the parochial schools. But almost immediately thereafter, the Board of Public Education devised and instituted a volunteer service under its own control. This service lasted from January 1 to November 1, 1900. It was incomplete and imperfect because unorganized and unpaid: yet there were discovered a total of 5,876 cases of illness of which 3,446 were contagious cases and 2,430 non-contagious. In addition, there were many non-contagious cases that were not reported, and many children who were excluded from school without report of their cases. Among these the reports emphasized 12 cases of well-developed diphtheria, 4 of scarlet fever, 112 of measles, 115 of mumps and 212 of lice; 1,001 cases of badly defective eyesight were reported in addition to 397 cases of contagious eye diseases. In our own city the past inspections have made an impression on parents, teachers, Sectional Boards and the Board of Public Education. The Department of Health and Charities is now anxious to increase its force of Assistant Medical Inspectors to a number that will permit them to include in the daily duties visits to the schools, which are the centers of the spread of contagious diseases. This meeting is intended to endorse and assist the Department in obtaining public recognition for its desire that the city practise the economy of the ounce of prevention, daily medical inspection of school children, rather than the pound of cure, which means a

full contagious hospital, schools closed for disinfection, sick children, and the work of the schools interrupted. The value of human life saved, to say nothing of the suffering, bereavements and diseases prevented, infinitely outweighs the comparatively trifling cost of a few additional Medical Inspectors.

Obituary.—Dr. William Shaw Stewart, one of the founders and ex-dean of the Medico-Chirurgical College, died suddenly of heart failure at his home, 1725 Pine street, November 25. Dr. Stewart was sixty-five years of age and had long been identified with the growth of medical science in Philadelphia. He graduated from Jefferson in 1860. He served throughout the Civil War as assistant surgeon. Dr. Stewart was instrumental in founding the Medico-Chirurgical College and for ten years was its Dean, being professor of obstetrics and clinical gynecology. He was professor emeritus at the time of his death.

CHICAGO.

Improved Milk Supply.—An improvement shown in the reduction of samples of milk below grade from 45 in every one hundred collected in 1893 to less than 8 in the hundred at the present time, is to be credited with a large share of the saving of children's lives between one and five years, the milk feeding period.

The relationship of the milk supply to infectious diseases of children is very intimate and work carried out by the Health Board of New York City in co-operation with the Rockefeller Institute is worthy of emulation and of the adoption of similar methods for the investigation of the conditions in Chicago.

Infectious Diseases.—Acute infectious diseases are fewest, but influenza shows signs of increased activity. Total deaths for the week were 467.

Appointment of Dr. Ruediger.—Dr. E. H. Ruediger of the Memorial Institute for Infectious Diseases, Chicago, has been appointed assistant in the Serum Institute, Manila, P. I.

Probert Fine.—It will be remembered by the readers of the MEDICAL NEWS that Arthur C. Probert, Vice-President of the Christian Hospital, was arrested on the complaint of Dr. J. B. Murphy and others on the ground that their names were being used without authority, on certificates of the hospital to induce other physicians to become members of the staff on payment of fees of varying amount, and was fined last week $500 and costs for the fraudulent use of the mails.

Salpingoscopy.—Dr. Joseph C. Beck read a paper on this subject before a recent meeting of the Chicago Laryngological and Climatological Association. This is a term given by Valentine to the method of examination of the ostium of the Eustachian tube and the nasopharynx by means of his salpingoscope, which is nothing more nor less than a small cystoscope. Hirschmann claims the priority of this in strument, and calls it the endoscope, for the purpose of examination of the nose, especially the ostia of the accessory sinuses. The various conditions the essayist uses this intrument for examining are as follows: (1) Acute salpingitis following and associated with an acute rhinitis, where the patient complains of a fulness in his ear; (2) acute rhinitis without the symptom of fullness in the ears. including hay fever; (3) acute otitis media non-suppurativa; (4) acute otitis media suppurativa; (5) chronic otitis media non-suppurativa; (6) chronic otitis media suppurativa; (7) in cases where he cannot place properly the Eustachian catheter or inflate with satisfaction; (8) in the use of a bougie; (9) adenoids; (10) chronic postnasal catarrh; (11) marked hypertrophies of the posterior ends of the inferior and middle turbinated bodies; (12) atrophic rhinitis; (13) examination of the ostium maxillaris in sinus disease, where the anterior half of the middle turbinated body had previously been removed; (14) the roof of the nose in the same conditions; (15) antrum of Highmore through the opening of the jaw; (16) the act of swallowing and speaking in the healthy subject and in one with paralysis of the soft palate; (17) tuberculous and syphilitic laryngitis, etc. The larynx may be examined by means of this instrument, being situated in the nose, the prism turned downward, and while the patient is instructed to breathe freely through the nose, one can see clearly the chink and sometimes the vocal cords. Again, it may be used in the mouth, as Valentine and others have used it, particularly in young individuals, and get a much larger and clearer image of the larynx. The author's conclusions are: (*a*) That it is an aid in diagnosis; (*b*) it is absolutely necessary to familiarize oneself with the technic and learn the comparative sizes of the structures; (*c*) its use is principally of value in the nasopharynx in examination of the ostium tuba.

Spastic Dysphonia.—Dr. John Edwin Rhodes contributed a short paper with this title. This term is applicable to any neurosis of the larynx which is characterized by difficulty in phonation. It is, so far as the larynx is concerned, a local condition rather than a disease, the lesion for which it is a symptom being one of the nervous system, and usually situated in the brain. It is a neurosis in which there is a spasm of the larynx, and a failure to properly coordinate its muscular action on attempts at phonation. In these cases on an inspection of the larynx a normal condition is found so far as appearances are concerned, while the respiratory function alone is taking place. However, as soon as the impulse to the muscles of phonation is sent along the efferent nerves there is an immediate spasmodic action of the larynx apparent, the voice being broken in a characteristic manner, but as soon as the attempt ceases the normal action of the larynx in phonation is resumed. The affection is rare, as MacKenzie has seen but 13 cases, although Lennox Brown believes that it is found more frequently, a statement with which most observers do not agree. The patient was a farmer, forty-two years of age, and gave the following history: His speech had been affected for twenty-three years, but had become worse in the last five years. Early in the history of the trouble there was an almost total loss of speech. The trouble seemed to begin rather suddenly as a cold, with loss of voice. As this was not restored after a time, he and his friends became alarmed. His family history shows the death of his mother from paralysis following typhoid fever at seventy-three years of age. Patient is of a nervous temperament, and has had several nervous breakdowns in the last few years. He is inclined to be morbid and constantly worries over his condition. There is a considerable loss of weight; from 140 pounds a few years ago and 125 pounds two years ago, his weight has declined to 119 pounds. He is rather anemic, having a pale, sallow complexion. His pulse is 72, and slightly unsteady. His temperature is a part of the time above normal, reaching 100.2° F. There is no cough, but some hacking and clearing of the throat. The appetite is good, but digestion is poor, and he complains of a miserable feeling in the bowels constantly. He is habitually constipated, and a constant user of cathartics. On attempts at phonation there is at

once a marked tremulousness of the voice. The words are broken and vibratory, more so at the very beginning of efforts to speak than when he has gotten well started; then the words are uttered more easily, some words having an even, clear tone, but most of them characterized by tremulousness; such use of the voice causes fatigue. When he is excited or a little embarrassed or tired, the trouble is more marked. The whisper voice is perfectly normal, and he can use it without fatigue for any length of time. There has never been any dyspnea. He has had nasal catarrh since childhood. The patient denies having had syphilis. There are a few enlarged follicles on the pharynx and some diseased crypts in the tonsils. The laryngeal structures show no evidences of inflammation. On attempts at phonation, the abduction is not delayed, but on the attempt at verbal utterance, the tremulousness of the cords is at once apparent. Tension is held for an instant only, when there seems to be a relaxation, allowing a fuller column of air to pass, throwing the vocal cords into vibration in their entire length. The arytenoids seemed fixed with no relaxation while this condition of tremulousness is observed. In the utterance of a single and prolonged note, there seems to be an uneven escape of the air column, an intermitting tension and relaxation. This condition is not apparent when he whispers. There are no evidences of this tremulousness elsewhere. There is none of it about the head, neck, or extremities, and it is not in evidence except when speaking. The reflexes are normal.

Skiagraphic Fallacies.—Dr. John A. Robison read a paper on this subject. He pointed out that the development of skiagraphic plates is more difficult than that of the ordinary plates. One must eliminate all sources of error intrinsic in the plate, the developing fluid, and the manipulation of the X-ray apparatus. He found quite a number of plates would develop more rapidly in certain spots than others. In one instance he was shown a plate where a dark spot over the region of the left kidney had been pronounced to be a renal calculus. He took two skiagraphs of this patient, and was unable to find the shadow. He persuaded the patient to secure another skiagraph from the first operator, who subsequently acknowledged he did not obtain the same result in his second plate. He has seen skiagraphs of lungs where the light areas seemed to prove the presence of pulmonary cavities, which light areas did not exist in subsequent plates. In the development of skiagraphs one has not the contrast of light and shadow, as in ordinary photography. The entire plate in the developing fluid speedily becomes dark, and it is easy to overdevelop the plate and obliterate the contrast between the lights and shadows. It is to secure the proper contrasts that experience in the exposure of the patient to the X-ray becomes necessary. It is only possible to secure good results by experience, and in medical skiagraphy the interpretation of the results can only be truthfully made by a physician, no layman having the necessary pathological knowledge to enable him to interpret the shadows cast by various pathological conditions. But granted that the technic has been perfect, errors may ensue from the wrong interpretation of the skiagraph. Two cases were narrated in point.

GENERAL.

Cause of Typhoid Fever at Williams College.—It has been determined by the authorities at Williams College, Mass., that the source of typhoid which recently developed among the students, and at one time threatened to become a serious epidemic, was a can of milk. The theory is that the milk was cooled in impure water, and that a little of the infected water accidentally got into the milk. The can in question did not come from a Williamstown dealer, but was brought from outside the town.

Cuba's Death Rate.—Statistics printed last week show that during 1902 the death rate in Havana was 21.9 per 1,000. There were 6,279 births and 5,832 deaths. The greatest number of deaths, 885, were from tuberculosis. There were 176 deaths from cancer and 469 from enteritis.

William Peirson Medical Association.—The following named physicians have been re-elected officers of the William Peirson Medical Association of Essex County, N. J., for the ensuing year. President, Thomas W. Harvey, M.D., Orange; First Vice-President, Richard C. Newton, M.D., Montclair; Second Vice-President, Joseph C. Young, Newark, N. J.; Treasurer, J. Hammond Bradshaw, M.D., Orange; Secretary, Richard D. Freeman, M.D., South Orange; Librarian, Henry A. Pulsford, M.D., South Orange; Council, the above named and Theron Y. Sutphen, M.D., Newark; Mefford Runyon, South Orange, and William B. Graves, East Orange.

Mississippi Valley Medical Association.—The thirtieth annual meeting of the Mississippi Valley Medical Association, will be held at Cincinnati, O., October 11, 12, 13, 1904. Dr. B. Merrill Ricketts has been elected Chairman of the Committee of Arrangements. The following are the officers of the Association elected at Memphis: President, Edwin Walker, M.D., Evansville, Ind.; President-elect, Hugh T. Patrick, M.D., Chicago, Ill.; First Vice-President, Bransford Lewis, M.D., St. Louis, Mo.; Second Vice-President, Geo. W. Cale, Jr., M.D., Springfield, Mo.; Secretary, Henry Enos Tuley, M.D., Louisville, Ky.; Assistant Secretary, S. C. Stanton, M.D., Chicago, Ill.; Treasurer, Thos. Hunt Stucky, M.D., Louisville, Ky.

The following resolution was offered by Dr. S. P. Collings, of Hot Springs, Ark., at the Memphis meeting.

Whereas, The value of perfect sight and hearing is not fully appreciated by educators, and neglect of the delicate organs of vision and hearing often leads to disease of these structures, therefore, be it

Resolved, That it is the sense of the Mississippi Valley Medical Association that measures be taken by Boards of Health, Boards of Education and School authorities, and where possible, legislation secured, looking to the examination of the eyes of all school children, that disease in its incipiency may be discovered and corrected.

The Government Hospital at Luzon.—According to the report of an officer serving in the Philippines, the hospital maintained there by the Government is in a flourishing and highly satisfactory condition. For three hundred years the Spaniards got no further than the recommendation for establishing a health station in the mountains of Benguet, which amounted to nothing more material than an indifferent discussion as to its site; but in 1902, shortly after the establishment of the Taft régime in the Archipelago a Civil Service Sanitarium was set up at Bagnio in the hilly region of Luzon. One of the difficulties, perhaps the chief difficulty, in starting an institution of this sort in the tropics is the matter of choosing a suitable location. In the lowlands one must always contend with the scorching days, sultry nights and pestiferous insects; while the highlands are often very little better and quite inaccessible. The latter condition is present in this attempt in some slight degree, but the hospital can be reached in something less than three days on horseback, a short journey as traveling goes in the Islands. A plateau three miles in circumference and lying 4,700

feet above sea level has been carefully laid out by a landscape gardener and on it the more permanent structures are to be erected. A natural advantage and one of very great importance is the soil of porous clay, while spring water of excellent quality can be readily obtained from the limestone hills. In 1902 a small pine house with a glass roof served to accommodate 8 or 10 patients, and in 1903 this was enlarged to provide for 50, with 5 cottages for special cases. Present appropriations allow for 20 new rooms and 7 new cottages. The Sanitarium is used also as a sort of hotel for those who wish to come up out of the heat and fatigue for a few days' rest. The daily temperature is 63° to 68° F., the nights are cool and blankets are required for sleeping. One dollar per day is charged to those who can afford it, while the more affluent can pay as much as $3.50 for subsistence and attendance.

Obituary.—Dr. Hawkins Brown, aged seventy-three, died at his home in Hustonville, Ky., of paralysis of the heart last Tuesday. He was an ex-President of the Kentucky State Medical Society, a surgeon of the First Kentucky Cavalry, and a medical officer of Gen. Stoneman's staff during the Civil War.

CORRESPONDENCE.

AMERICAN AND INTERNATIONAL CONGRESSES ON TUBERCULOSIS AND TUBERCULOSIS EXHIBITS FOR THE YEARS 1904 AND 1905.

To the Editor of the MEDICAL NEWS:

DEAR SIR: During the past few months I have been the recipient of a large number of inquiries concerning the various tuberculosis congresses (American and International) which have been projected for the years 1904 and 1905. The multiplicity of these various congresses and the similarity of their names leads naturally to great confusion. It would be really too great a task to undertake to answer in full and individually all the letters with which I have been honored. I therefore ask you to grant me the space to give the desired information in your esteemed paper, so that all the readers of the MEDICAL NEWS, who may be interested, will have a clear idea of the various congresses, their officers, and time and place of meeting.

It is announced that a congress on tuberculosis is to be held in St. Louis on October 3, 4 and 5, 1904, under the name of International Congress on Tuberculosis. Upon careful inquiries I learned the following facts about this congress: Mr. Francis, the President of the St. Louis Exhibition, has been approached by the officers of the American Congress on Tuberculosis, which was founded some years ago by Clark Bell, Esq., a lawyer of the City of New York, to sanction the holding of an international congress on tuberculosis in connection with the Louisiana Purchase Exposition. From a letter received from Dr. E. J. Barrick, of Toronto, Canada, the now President of this American Congress, I learn that Mr. Francis has appointed the above-mentioned Mr. Clark Bell Chairman of the Committee on Organization. Mr. Clark Bell is also the Treasurer and Chairman of the Executive Committee of the American Congress on Tuberculosis, season 1903-1904; a Mr. Samuel Bell Thomas, of 290 Broadway, New York, is the Secretary of the latter. The officers of the International Congress are not yet elected. I was desirous to learn the names of other medical men interested in this congress, and Dr. Barrick very kindly wrote me on Nov. 16 that he had asked Mr. Bell to furnish me the desired additional information, but nothing has thus far been received.

The other international tuberculosis congress announced is the one to meet in Washington, D. C., April 4, 5 and 6, 1905. It is to be held under the auspices of The American Congress on Tuberculosis for the Prevention of Consumption. The following is a list of the officers of this latter organization:

Honorary President, Dr. Henry D. Holton, Brattleboro, Vt.

Member, Executive Council, Dr. Chas. O. Probst, Columbus, O.

President, Dr. Daniel Lewis, New York.

1st Vice-Pres., Dr. E. A. Egan, Springfield, Ill.

2d Vice-Pres., Dr. Frank Paschal, San Antonio, Tex.

4th Vice-Pres., Dr. Irving A. Watson, Concord, N. H.

5th Vice-Pres., Dr. Chas. Wood Fassett, St. Joseph, Mo.

Secretary, Dr. George Brown, Atlanta, Ga.

Treasurer, Dr. P. H. Bryce, Toronto, Canada.

Before going further, I would like to call the attention of the readers to the difference in name of the two American congresses. The one is American Congress on Tuberculosis, the other The American Congress on Tuberculosis for the Prevention of Consumption.

The congress which was to meet under the name of Congres International de la Tuberculose at Paris from Sept. 26 to Oct. 1, 1904, has been recently postponed to the year 1905. The President of this Congress is Professor Brouardel, Hon. Dean of the Faculty of Medicine of Paris. The General Secretary is Dr. M. Letulle, Prof. agrege of the Faculty of Medicine, residing at 7 rue Magdebourg, Paris. This Congress will be divided in two sections, the medical and the social:

I. In the medical section the following subjects will be discussed: (1) New methods for the treatment of lupus; (2) new methods for the early diagnosis of tuberculosis; (3) comparative studies on the different forms of tuberculosis.

II. In the social section: (1) Etiological factors in tuberculosis; (2) value of different means for the treatment of tuberculosis; (3) the voluntary insurance and the mutual societies in the combat of tuberculosis.

The Congress will furthermore form a technical section under the name of Museum of the Congress.

There will be held during the coming year independently of the above mentioned congresses two tuberculosis exhibitions, one in Baltimore, Md., and the other in St. Louis, Mo. The Baltimore Tuberculosis Exhibition will be held in January, 1904, under the combined auspices of the Tuberculosis Commission, the State Board of Health, and the Maryland Public Health Association. Details are in charge of Dr. W. S. Thayer, president of the Commission; Mr. John M. Glenn, secretary; Dr. John S. Fulton, secretary of the State Board of Health, and Dr. Marshall L. Price. Dr. Henry B. Jacobs has been elected Chairman, and 250 prominent professional men and laymen have been asked to act as an advisory committee. A series of lectures will be given, the object of which will be to present the extent and effects of the disease in a striking manner. The pathological, hygienic, sanatorium and sociological aspects of the tuberculosis problem will be practically demonstrated by specimens, charts, literature, instruments, photographs and plans. All communications concerning the exhibition should be addressed to Dr. Marshall Langton Price, 10 South Street, Baltimore, Md.

The other tuberculosis exhibition will be held in St. Louis, in connection with the exhibition of Social Economy and under the Subsection of Hygiene, of which Dr. J. N. Hurty, of Indianapolis, is Superintendent. To avoid multiplicity of exhibits, Dr. Hurty has put himself in communication with the General Secretary of the International Bureau for the Prevention of Consumption at Berlin, Professor Pannwitz, so

that the exhibits which the European countries contemplate to send shall also come under his direction.

All indications point toward success of both exhibits, and it is to be hoped that they will fulfill their high purpose and at the same time be a credit to American physicians and hygienists.

Considering the various congresses I do not hesitate to express a feeling of deep anxiety. The first one mentioned, which, for reason of brevity, I will call "The Bell Congress," because it owes its inception to Mr. Clark Bell, has to my knowledge not the support of our best known men in the field of clinical medicine, hygiene, tuberculosis pathology, or tuberculo-therapeutics.

The second congress in point of time, which again for sake of brevity and clearness I may call the "Lewis-Brown Congress" (names of the President and Secretary), while it has many distinguished men of various State and Provincial Boards of Health among the members, has, like the Bell Congress, thus far not among them the men we are wont to look up to as leaders in movements of this kind. No such men as Biggs, Billings, Bowditch, Flick, Jacobi, Janeway, Klebs, Osler, Otis, Trudeau, Tyson are connected with this Congress.

What are our confrères across the water to think if they hear of two American congresses on tuberculosis, and each having an international one under its auspices? The European authorities found it best, instead of having a triennial congress, to have one more year to intervene. This will make the congress in Washington and the one in Paris convene in the same year (1905).

I hope this letter, which I address to the medical profession in America, will result in a satisfactory solution of this very complicated problem. If President Francis, of the St. Louis Exposition, desires that a tuberculosis congress shall be held in St. Louis, let him call to his aid some of the men whom I have mentioned as leaders in our profession. They will counsel with him on the advisability of such a congress, and if it is decided that one should be held, Mr. Francis can be assured that the best element of Europe and America will come to St. Louis to contribute to its success.

The officers and members of the Lewis-Brown Congress must realize that they cannot expect to have their international meeting in Washington to be successful, when, six months later, there will be an international congress in Paris. I hope that there will be enough patriotism and national pride for all interested to realize that two American congresses on tuberculosis is an anomaly, and that, if the St. Louis Congress is to be a success, it must be in the hands of medical men well and favorably known in this country and abroad.

As a solution of the problem I beg leave to suggest the following: During the Tuberculosis Exhibition in Baltimore next January, all interested should meet on a certain date on this neutral ground for the purpose of coming to an agreement about a single representative National or International Tuberculosis Congress, to be held in America. There, too, should be formed a National Committee on Tuberculosis, which is to be in touch with the international tuberculosis congress, which will convene in Paris in 1905.

16 West Ninety-fifth Street,
New York, Nov. 27, 1903.

S. A. KNOPF, M.D.

The Urine after Splenectomy.—The following effects of ablation of the spleen upon the urinary secretion were noted by L. E. and F. DEMOULIN and J. NICOLAS (Jour. de Physiol. et de Path. Gén., Sept. 15, 1903): A slight increase in volume, an increase in the content of urea, possibly to be attributed to a hyperactivity of the liver, a transient and slight augmentation of the chlorides and diminution of phosphates, and the absence of glycosuria or albuminuria.

OBITUARY.

DR. CYRUS EDSON.

DR. CYRUS EDSON, of New York, son of ex-Mayor Franklin Edson, died late Wednesday night in the Roosevelt Hospital from double pneumonia.

After an almost continuous attendance on his patients, one of whom had died of a violent attack of pneumonia last Saturday morning, Dr. Edson concluded to take a few days' recreation in the country. He was a member of the Larchmont Club and went there in the early part of the day, where he played golf until nightfall.

On Sunday morning he was found in bed greatly depressed from a severe chill; evidences of pneumonia soon became apparent and he was removed to Roosevelt Hospital without delay.

Dr. Edson was born in Albany on Sept. 8, 1857. He was educated first at a military school at Throgg's Neck, N. Y., and afterward at Columbia College, where he rowed in the 'Varsity crew. He was also a member of the famous Henley four.

Dr. Edson graduated from the College of Physicians and Surgeons in 1881 and was chosen by his class as Grand Marshal. In 1882 he was appointed Assistant Sanitary Inspector in the New York Health Department and was promoted through the regular grades to Commissioner. He was appointed by Gov. Cornell as Assistant Surgeon of the Twelfth Regiment on the staff of Col. Cruger, and served in this office for about one year, when he received an appointment on the First Division staff.

He was President of the Board of Pharmacy of this city and of the County of New York in 1893, and during his career he held the following positions: Chief Inspector of the Second Division in the New York Health Department, Visiting Physician to the Charity Hospital, Vice-President of the American Society of Public Analysis, and Secretary of the Committee on Hygiene of the New York County Medical Society.

Dr. Edson was also the author of many articles on medical and sanitary subjects and the inventor of useful surgical instruments. He was President and Director of the New York Pharmacal Company, Vice-President and Director of the Rapid Safety Filter Company, and a member of the St. Andrews and New England Societies, the Larchmont Yacht Club, and the Society of Medical Jurisprudence.

SOCIETY PROCEEDINGS.

NEW YORK ACADEMY OF MEDICINE.

SECTION ON GENITO-URINARY SURGERY.

Stated Meeting, held October 21, 1903.

Dr. Howard Lilienthal, Chairman *pro tem.*, in the Chair.

Deformity of Penis Resulting from Operations for Relief of Hypospadias.—Dr. Howard Lilienthal presented a man, twenty-two years old, who had been admitted to Mount Sinai Hospital April 13, 1903, and discharged one month later, after an operation for the relief of a deformity which had followed ten previous operations for the relief of hypospadias. The patient had stated that the opening had been about three-quarters of an inch behind the end of the glans. When he was first seen by Dr. Lilienthal the deformity was such that it was difficult to recognize the organ as a penis. So far as his sexual function was concerned, he was apparently normal and he urinated very satisfactorily, although the stream passed in every conceivable direction. Of course, the cosmetic effect was bad. The first

operation performed upon him was a Beck and it appeared as if, when the urethra had been drawn through to the anterior part of the glans and stitched there, it had sloughed and, as it descended, it seemed to have drawn with it a portion of the glans which, when Dr. Lilienthal first saw him, appeared as an isolated fragment, entirely separated from the glans penis.

Extravasation of Urine, Due to Phimosis.—The patient, forty-five years of age, single, had always been troubled with tight prepuce, never having been able to expose the glans penis more than around the meatus. During the past few years, especially, the tissues have become thickened from frequent attacks of balanoposthitis, and some weeks previous to admission to Bellevue Hospital he contracted what was apparently a chancroid. Previous history of gonorrhea of some years' standing, uncertain. Micturition had been frequent, painful and attended with great effort and straining, until upon the early morning of the day of admission the patient found himself unable to pass anything, when, after pressure and straining, he felt something give way, with slight sensation of relief. A few hours after that time he applied for admission. When the doctor first saw him on the afternoon of the same day the whole penis was immensely swollen from an apparent infiltration, which extended back and involved the scrotum, to about the size of a large orange, giving a perfect clinical picture of extravasation from stricture, and as the penis alone, according to the patient's history, had been at first involved (the scrotum secondarily), and as he was rather heavy mentally as regards previous history as to clap, the doctor was under the impression at first that he was dealing with an anterior extravasation due to stricture, the House Staff having informed him that they had been unable to pass any instrument. The preputial opening was absolutely closed, but a dorsal incision over the glans liberated a large quantity of blood and urine, exposing to view a normal meatus, through which a No. 30 steel sound readily slipped into the bladder. The point where rupture had taken place was apparently just posterior to one side of the frenum. The incision made for the circumcision, passing through the part, which was readily made out in the fresh specimen, is difficult to find now, on account of the shrinkage due to formalin. Incisions were made in the scrotum, and the case made a normal recovery.

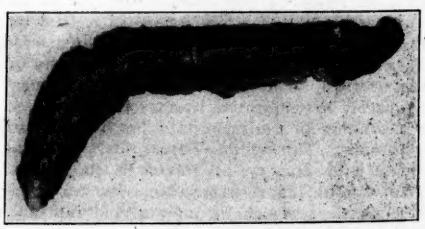
Retention of Urine, Due to Foreign Body in Bladder, of Uncertain Origin.—Widower, thirty-nine years of age. First attack of gonorrhea nineteen years ago, with no complications. Second attack, seven years ago, followed by posterior urethritis and cystitis. Micturition the following winter, being three or four times at night, increasing in frequency, until last February he was obliged to get up from ten to fifteen times, at which time he first noticed blood in his urine, *mixed, and never in clots.* When there was no blood, the sediment was marked. During March, an apparent exposure to cold caused an acute retention. Later on, incontinence, which lasted until the middle of April, when he was taken to a Dispensary, prescribed for, and again suffered from retention. He was then catheterized for the first time (no instrument of any sort ever having been previously passed), and a large amount of bloody urine withdrawn. A few hours later he applied for admission to Bellevue Hospital, still with retention. Examination of the urethra showed an obstruction beyond the cut-off muscle, near the bladder neck, while the catheter gave the sensation of passing into and through a roughened false passage, and then into a cavity from which bloody urine was drawn. As it seemed unwise to perform an external urethrotomy, with such an uncertain guide, the doctor determined upon a suprapubic cystotomy, to be followed, if necessary, by a retrograde catheterization, and then urethrotomy. The mucous membrane of the bladder was found highly congested and thickened, as a result of the cystitis, and upon examination of the internal orifice of the urethra this was found quite occluded by what to the finger felt like a semisolid roughened mass. This mass reached backward, and spreading out,

Fig. 1.

Foreign body removed from bladder. Inferior surface, full size.

covered the base of the bladder, to which it was firmly adherent, and when removed, seemed like a partly solidified gauze wipe, covered with a deposit of urinary salts, and triangular in shape, the sides being 6 to 7 cm. in length, the anterior angle or point being twisted and pushed into the urethra (as one would do with a piece of gauze when trying to plug an opening), for a distance of about 1½ cm. But slight hemorrhages from the place of attachment occurred. The urethra was found patent and a full-sized sound passed. Drainage was ob-

Fig. 2.



Foreign body removed from bladder. Left lateral surface, full size. Should be turned to the right 45°, to represent position in bladder, urethral neck.

tained both suprapubically and through the urethra. As there was considerable cystitis present, these drainages were both left *in situ* for some time, the suprapubic tube for two weeks (five days after which the wound closed), and the catheter for three weeks (irrigation having been kept up from two to five times in twenty-four hours). Subsequently the wound reopened, with considerable leakage, and this remained so for several weeks. A perineal drainage was done, but when the patient left the hospital there was still leakage. The exact nature of the mass was impossible to learn; macroscopically it

looked like a gauze wipe, though this was soon disproved both by no history of a previous operation, and by microscope. The diagnosis lay between an exfoliated mucous membrane, the results of the prolonged cystitis, and the remains of a blood clot. The pathological report said that "it was impossible to say whether it was the remains of a blood clot, from which the blood had been washed out, or whether it was originally tissue, as in one or two places it looked like necrotic tissue, but the appearance was not decisive."

Gangrenous Peri-urethral Abscess, of Diabetic Origin.—Dr. M. W. Ware reported this case. The patient was a man, sixty-two years old, who had called his family physician to attend him for chills and fever, which had existed for two weeks. When the physician saw him he excluded everything but malaria, taking into consideration everything that was possible, such as infection, sepsis, etc., examining carefully every portion of the man's body. At the end of two weeks the patient for the first time complained of pain in the perineum, where a swelling was found. This man appeared to be in perfect health and the only statement made concerning himself was that he had had diabetes for twenty years. Absolutely nothing further could be learned from him about the swelling and tenderness in the perineum. There was no redness over it. An examination per rectum revealed the swelling very close to the prostate. The prostate was in a condition consistent with a man of his age. He only got up once a night to urinate. Although he passed large quantities of urine, it was passed in a perfect stream. There was no discharge of blood or pus from the urethra. In fact, there was no clue whatever to the origin of the abscess other than diabetes. He had no temperature or pain and no fluctuation could be detected in the swelling. The mass was incised and a very large amount of pus and slough was evacuated from the perineum. The bulb was exposed and the urethra became visible and looked somewhat peculiar. It occurred to the doctor that if he packed the opening tightly to control the bleeding the patient might have difficulty in passing his urine. He was on the verge of cleansing the urethra preliminary to catheterization when suddenly there was a great escape of blood, and he then thought of the likelihood of a stricture. The catheter was introduced, but could not go beyond a certain point. He found that he had to deal with a gangrenous slough of the urethra. What prevented the escape of pus and blood into the urethra was the mucous membrane, which was intact up to the time of operation. He attempted to drain the bladder, but could not find the proximal portion of the bladder. Not one drop of urine came from the bladder, even when pressure was exerted. Of course, the only thing to do was to drain the bladder, and, therefore, he did a retrograde catheterization, making a suprapubic section. The operation was successful, although very protracted, lasting three hours. The patient lived ten days in fairly good condition, when signs of coma developed and he died. The wound never healed kindly. There was a primary gangrenous cellulitis in the vicinity of the urethra which would not perforate. The question of the propriety of doing a suprapubic section was dwelt upon by the speaker and he thought that if the patient had been left alone sufficient drainage would have occurred from below.

Dr. Pedersen agreed with Dr. Ware's own criticism, in thinking that the suprapubic cystotomy could have been avoided. The urine would have escaped through the perineal wound or could have been drained off through the perineal wound without producing any bad results. He had seen several cases of perineal abscess, sometimes surrounding the bulb of the urethra, sometimes situated to one or the other side of the midline, for which there was nothing to account, except the absorption of pyogenic germs through the skin or through the urethra. All of these abscesses had been very tense and had given very little sense of fluctuation. When incised the pus had spurted out with force.

Dr. Ware said that there was no fluctuation at all, but the abscess was very tense. He did not pass a sound in the beginning. He foresaw no indication for it, because the patient gave no symptoms referable to the bladder, except that he got up once a night. He believed that had he passed a sound at first a large amount of blood and pus would have escaped at once. When he opened the abscess in the perineum there occurred a large spurt of pus, which was followed by great relief; this pressure, he thought, must have torn this urethra, which allowed the escape of blood and pus. With regard to the origin of the abscess he said he was at a loss to account for it. When abscesses are found in diabetic and gangrenous cases, it was customary to fall back for an explanation upon the local element of arteriosclerosis and this certainly existed in this patient, who was sixty-two years old. The infection he thought possibly came from the rectum or uretnra. There was also to be considered the possibility of stone in the urethra which escaped with the pus, and blood when the abscess was opened, but this view is purely hypothetical.

Cases of Urethral Stricture and Their Management.—Dr. James Pedersen read this paper, and said that it comprised the report of seven cases, chosen to illustrate some of the phases and complications of urethral stricture, and to describe the management that seemed appropriate to each individual case. The term "management" was preferred to the term "treatment of stricture," because including all that was necessary to secure to the patient the best ultimate results. Case I was one of a small caliber stricture, complicated by an acute specific urethritis. The urethritis ran its course in five weeks under a hand injection of 1-30,000 bichloride and hot sitz-baths, followed later on by a mild astringent, without causing retention. Dilatation was not begun until two weeks later, and had reached a No. 20 F. when the patient disappeared from observation. Case II was one of irritable and somewhat resilient stricture, which yielded to careful, persistent, dilatation in spite of interruptions in the course, during the patient's absence abroad. The patient entered the hospital with retention of urine, which was relieved with filiform guide and tunnel catheter. A urethral chill followed the first three dilatations, and on one occasion spasmodic retention supervened. Thereafter, by the administration of quinine, irrigation of the urethra with 1-30,000 bichloride, and the use of sterile oil for the lubricant, a recurrence of the chills was prevented. Topical applications of protargol at first and later a silver nitrate solution (1-1,000) were used to overcome the irritability. A month before the end of the second year the patient was passing a No. 29 F. steel sound every third week without reaction and without other precaution than ordinary asepsis. This was discontinued six and a half months later, and now, at the end of a year, neither recontraction nor irritability had developed, and the caliber remained 29 F., as proven by a recent exploration.

Case III presented with a filiform stricture of long standing, deep within the penile urethra. Every course of dilatation that the patient had undertaken had produced epididymitis; consequently he had neglected himself. Once epididymitis had developed independently of any instrumentation. The urine was cloudy, faintly ammoniacal, and full of shreds. After five days of preparation, during which the patient used a hand in-

jection of 1-30,000 bichloride of mercury solution, drank freely of water, and took cystogen, dilatation was begun with a filiform and No. 12 F. tunnel catheter. By the utmost conservatism and the use of 1-3,000 silver nitrate solution instilled into the bladder and voided after each instrumentation, the caliber of the stricture had been increased to No. 24 F. at the end of the fifth month without producing epididymitis or in any way interfering with the patient's attention to an active business. Four months later, in the presence of concentrated urine, the result of errors in diet to which the patient was prone, and immediately after violent exercise and a slight traumatism to the testicle, epididymitis occurred eight days after instrumentation. This accident had occurred in all four times under Dr. Pedersen's observation; twice under conditions similar to the above, and twice after careful attempts to increase the caliber to No. 26 F. The condition of the bladder and the urine remained good, and the patient's general health was now perfect. Treatment in this case was now centered upon the granular condition of the deep urethra.

Case IV applied for the relief of a urinary fistule that opened in the perineoscrotal angle; it leaked urine continuously and allowed a large quantity to escape during every urination. This condition was consequent upon a complete rupture of the urethra sustained one year before. A competent surgeon had operated to relieve the extravasation, which had become extreme and subsequently had reunited the torn urethra. The after-treatment had been interrupted, and the patient had been left in the above described condition. His general health and spirits had become greatly impaired. Examination disclosed a tortuous, filiform stricture in the midpenile urethra. Gradual dilatation with filiform and tunnel instruments and topical treatment of the urethral mucous membrane with silver nitrate solutions closed the fistule on the fifteenth day, when the caliber had reached No. 20 F. Thereafter, as the dilatation progressed at intervals of from one to two weeks, the sinus was alternately open and closed, but at most it allowed only a few drops to escape during urination (the continuous leaking having permanently ceased), until, in the course of the twenty-first week, it closed permanently. The patient now was taught to pass his own sound and the topical treatment of the urethral mucous membrane was continued. Long before this he had recovered his health and had resumed active business. When last seen, a year ago, he was passing a No. 28 F. easily once a week, and had been given instructions to report for inspection, that the frequency with which he should pass the sound could be diminished if possible.

Case V was one of recontraction to a filiform stricture following a neglected urethrotomy performed twelve years before. The smallest tunnel instrument could not be guided through the stricture. The patient being a drinking man, was not able to cooperate properly, and after two attempts to dilate the stricture beyond the risk of retention, an external urethrotomy was performed in the usual way. The patient left the hospital on the thirteenth day and the usual after-treatment was begun.

Case VI was taken as typical of stricture of large caliber, with secondary posterior urethritis and urethrocystitis due to an antecedent urethritis, the irritation of the stricture itself, the excessive use of tobacco and coffee, lithuria, and the practice of withdrawal, in which the patient had indulged three times a week for the three preceding years. The patient had received various forms of treatment with only very temporary benefit. He had begun to use morphine suppositories. The symptoms were so suggestive of vesical calculus that after excluding acute prostatitis, the bladder was searched, but with negative result. Tuberculosis was next excluded. Under rest in bed, bland diet, free diuresis, cystogen and very gentle irrigation of the bladder from the meatus, any distention of the bladder being avoided, he began to improve at once. So soon as the acute symptoms had abated an examination was made that disclosed the stricture of large caliber. This was dilated to a No. 26 F., and the urethral mucous membrane was treated with the usual topical applications of protargol solutions first and silver nitrate solutions later; four times at weekly intervals and again at the end of two weeks. He returned home entirely free from all urethral irritability.

Case VII was one with a series of strictures of about 14 F. in the course of the penile urethra, and a foul scrotal abscess of four months' standing due to extravasation. Through the sinus leading to the abscess a large volume of urine escaped with each urination. The patient was poorly nourished, and in bad general condition, being slightly septic and uremic. After three days of the usual preparatory treatment an external urethrotomy was performed in the usual way, the abscess sinus dissected out, and the abscess thoroughly curetted and drained. A catheter-splint was left in the penile urethra until the fifth day. Perineal drainage was maintained until the tenth day. Owing to a misunderstanding a sound was thereafter passed somewhat too frequently until the seventeenth day. It was then discontinued; but irrigation of the bladder with boric solution once daily was begun to correct the cystitis. Through an error the bladder was filled to its capacity at each irrigation. Thereupon the patient developed an irregular temperature, ranging from 99° to 104° F. The bladder irrigation was discontinued at once. Under free diuresis, stimulants, the urinary antiseptics and creosote, the fever ran its course in about three weeks. The sinus and wound in the scrotum healed permanently without interruption. The patient is now in excellent health, and his urethra has the caliber of a No. 24 F. The paper closed with a summary of certain details in the technic, namely: irrigation of the penile urethra; the choice of instruments; the treatment of the bladder; the topical treatment of the urethral mucous membrane, and the regulation of the patient's use of a sound when necessary.

Dr. Albert A. Berg said he was very much interested in the relation of the cases by Dr. Pedersen, and especially in the one of ruptured urethra, and he wished to know the condition of the tissues of the perineum at the time of operation, when extravasation existed, and whether the parts were gangrenous or not. He asked this question in order to bring forward the advisability of attempting to get primary union of the divided ends of the urethra and to consider the method by which such union should be made. If the tissues were gangrenous primary union was out of the question. The result obtained in such cases from passing a catheter through the urethra into the bladder to permit the parts of the severed urethra to regenerate as proposed by Guyon, was so good that it was a question whether we should complicate such a possibility by attempting to get primary union with sutures. Where we wished to avoid a prolonged after-treatment such sutures might be made by an end-to-end anastomosis. He had recently resected the penile urethra in a boy six years old, for primary stricture and cicatricial stenosis of the canal, and he made an anastomosis by Maunsell's method. The final result was good and no stenosis followed the operation. He believed that Guyon's method of passing the catheter into the bladder from the penile portion fulfilled every purpose.

Dr. G. M. Muren, of Brooklyn, took exception to the use of an 18 F. sound by the patient in the first case re-

lated by Dr. Pedersen. He did not believe it was proper to allow the patient to pass an urethral instrument on himself unless the sound was a large one, and used after the surgeon had dilated the stricture. Students were taught differently. In Dr. Pedersen's fourth case the bladder was entered with a small instrument and he believed that if one could get into the bladder even with a filiform guide urethrotomy was not indicated, except in a very small proportion of cases when of traumatic origin. He thought that if the doctor had persisted with the filiform and tunnel sound, he might have avoided operation. Almost all urethral strictures could be treated by dilatation unless of traumatic origin. The Maisonneuve, the smallest urethrotome, equaled an 8 F. sound, and if an 8 F. could be passed there was very rarely any indication of urethrotomy.

Dr. Walter B. Brouner said that the conservative manner of treating his cases was highly instructive. The more cases one saw and the more operating on such that one did made one the more conservative, and good results would be obtained if one waited long enough.

Dr. Howard Lilienthal said that a great many strictures were now dilated which would have been cut a few years ago. When patients show signs of sepsis after every manipulation about the urethra, then he believed every manipulation became practically an operation. The case reported undoubtedly had to be cut and perineal section was the operation to be preferred. He recollected cases which came under his notice, fortunately not his own, in which fatal sepsis occurred following catheterization. He had had two cases; one of these died of sepsis on account of an urethral instrument being passed by a very competent man. Dr. Lilienthal had the misfortune to have one case in which he did an internal urethrotomy one and a half inches back of the meatus in a very susceptible individual, who had septic symptoms after each instrumentation. He should not have performed this operation without perineal section in this particular individual. At post-mortem there was found a general staphylococcus infection with hemorrhages in the brain and serous cavities. Before doing internal urethrotomy the patient was for three days carefully prepared for operation, washing out the urethra with boric acid solutions, etc., and every possible precaution taken, but still the patient died of sepsis. Every time a sound, or soft instrument was passed the patient had a decided chill, and each time it was thought he would die. In ordinary cases he thought we should persist in dilatation. He asked Dr. Pedersen how long the third case was kept in bed with each attack of epididymitis.

Dr. James Pedersen said that the patient was kept in bed from two to four or five days. The patient had had several attacks of epididymitis before coming under treatment. Within the past year, after being free from them for nine months, he seemed to become more or less used to them, and the testicle was strapped and supported and the man was then able to go about his business.

Dr. Pedersen could not say whether actual gangrene had occurred in the case of ruptured urethra. The patient had not been informed as to such details and he inferred not. It might be assumed, he thought, that the surgeon postponed the suture operation because the tissues were so infiltrated (the extravasation having been in existence forty-eight hours) that to find the ends of the urethra would have been very difficult. Regarding the patient who ran a protracted temperature, he ascribed it to a pyelitis or to some chronic focus in the kidneys reawakened by the back pressure exerted when the bladder was overdistended with the irrigating fluid contrary to orders. The patient was fifty-nine years old and had had a strictured urethra for many years; therefore, the ureters must have become dilated and the kidneys more or less affected. He did not think the temperature due to the instrumentation alone, as that had been successfully performed for several days without exciting any reaction. Regarding the use of sounds of small caliber (less than a No. 20 F.) by a patient, he agreed with the speaker, who offered the criticism, but believed that on occasions an exception could be made to the rule he himself followed, not to allow a patient to pass a smaller sound than 24 F. He believed the case in question justified an exception, as the patient was familiar with the peculiarities of his own urethra, and as the passage of the sound was performed in the office under his supervision. He could not agree with the same speaker that the proper management for all strictures was dilatation. He took the position that every attempt at dilatation should be made before resorting to urethrotomy, and from his experience he could say that by far the larger percentage of strictures would yield to persistent, careful, gradual dilatation, as he thought he had demonstrated in the cases reported; but he believed that there were a few cases in which urethrotomy was the better management. Regarding sepsis and the wisdom of performing urethrotomy instead of dilatation in cases where sepsis had occurred, he believed that such an accident as Dr. Lilienthal had related would occur in the practice of every genito-urinary surgeon. He himself had had the experience twice, the first case was that of a large, robust man on whom, after suitable preparation, he had performed an internal urethrotomy for a stricture situated three inches from the meatus. Eight hours after the operation the patient died. The second case was that of an old man living at a distance from the city, whom he saw in consultation. The symptoms were those of vesical calculus. Catheterism under the usual precautions had been performed a few times in the course of the preparatory treatment. Suddenly the patient developed a severe chill and died at the end of half an hour. Before approaching such a case he believes it necessary to caution the family that the patient had reached a critical period in his life and that considerable risk attended such a simple operation as catheterism under those conditions. He had never had any ill effects from the use of iodoform oil. Nevertheless he had already abandoned it for the use of plain sterile sweet almond oil, which was fully as useful. He believed that plugging the orifice of the fistule in the case of traumatic rupture in order to retain a solution of eucain would not have accomplished the result, as at the time when the local anesthesia was most needed it would have flowed from the urethra back into the bladder. The patient who had suffered recurring attacks of epididymitis had remained in bed from two to five days with each attack. By strapping the testicle the patient had been able to get about very soon after the development of a mild epididymitis. He pointed out that no epididymitis had occurred during the first nine months of treatment.

OBSTETRICAL SOCIETY OF PHILADELPHIA.

Stated Meeting, held Thursday, October 1, 1903.

The President, John M. Fisher, M.D., in the Chair.

Gauze-bearing Tape, and the Gravity Pad, in Pelvic and Abdominal Surgery.—Dr. John M. Fisher read this paper. The one, it is claimed obviates the annoyance of a miscount in the number of gauze pads used for isolating and exposing the field of operation,

and positively eliminates the danger of the loss of any pads within the abdominal cavity, at the same time minimizing the possibility of losing unsecured pads for rapid sponging, while the other supplements and enhances the advantages of the Trendelenburg posture. The gauze-bearing tape consists of a piece of white tape about a half inch in width and of variable length (three or four feet) armed at one end with a long blunt-pointed needle or bodkin. The gravity pad is nothing more than a large gauze pad, concealed within its folds and fastened to the center of which is a lead plate two by three inches and weighing a half pound. Instead of a single piece of lead smaller plates of the metal may be held in quilted squares of the pad or at indifferent points. The practical utility of the tape was first demonstrated by Dr. Fisher at St. Joseph's Hospital, Philadelphia, on July 27, 1903, in an operation for pelvic disease requiring a number of gauze pads to hold the intestines at a proper level and expose the field of operation. One end of a long piece of gauze was introduced into the abdomen while the nurse quickly, and without any loss of time to the operator, perforated the other extremity with the needle and tape, securing its edge to the distal end of the latter with a turnover tie. After the entire pad had been packed into the cavity with the free portion of the tape trailing from the abdominal opening, other pads were strung on the tape in a like manner but without the necessity of securing them with a knot—the first and successive pads acting as points of fixation for those that followed. No account was taken of the pads thus introduced, nor was this necessary, for the reason that, after a sufficient number were in use to answer the purpose indicated, the removal of same upon the completion of the operation, simply depended upon the withdrawal of the tape to which all were attached. On the following day the same device was used with entire satisfaction in an operation for suppurative appendicitis; while the combined advantages of the gravity pad and the tape were first employed in an unusually trying case of suppurative disease of the uterine adnexa. In operating upon the latter patient it was shown that weight properly distributed is of more importance than bulk in holding the intestines at a proper level. Without the gravity pad three times the quantity of gauze would not have given the same satisfactory result in isolating and exposing the pelvic contents. He contends that by the use of this pad the certainty not alone of confining the intestines to the upper abdominal cavity, but that the maintenance of a more or less immovable wall, against which gauze may be packed to isolate the field of operation and protect the healthy peritoneum from contact with infecting materials, seems to be assured. The gauze-bearing tape was employed in several other abdominal operations by Dr. Fisher with such uniform satisfaction that he feels inclined to continue its use until a more certain method, or a simpler device is presented to safeguard the surgeon against the loss of a sponge within the abdominal cavity—an accident that has befallen some of the most experienced, and very many of the most careful and eminently painstaking operators of our day.

Report of a Case of Rupture of the Parturient Uterus in which Hysterectomy was Followed by Recovery.—This case was reported by Dr. Francis T. Stewart. The patient, a multipara, aged thirty-eight years, had never experienced any unusual difficulty during previous labors. During the last labor she had vigorous uterine contractions up to the seventeenth hour, when the pains suddenly ceased with an enormous hemorrhage from the vagina. Three hours later a dead child was delivered by podalic version. In removing the placenta, which came away spontaneously a large portion of the omentum was found in the vagina. The patient was exsanguinated and very much shocked. Seven hours after the rupture a total abdominal hysterectomy was performed. The laceration of the uterus extended along the left lateral wall from near the fundus down to and into the vagina. The uterus contained a few scattered fibroids and was abnormally friable. The patient made an uninterrupted recovery.

Structures Taking Part in Menstruation.—This paper was read by Dr. E. E. Montgomery, in which he discussed the occurrence of menstruation, the phenomena of increased arterial tension, the tendency of weak vessels to rupture in different portions of the body, and where the hemorrhage following was sufficient to reduce the blood tension, that such hemorrhage would take the place of menstruation, and be known as vicarious menstruation. He discussed the various theories as to the cause of its periodical occurrence, referred particularly to the investigations of Fraenkel which disclosed the glandular character of the corpus luteum, and the probability that its secretion produced an influence upon the blood and nervous system sufficient to induce the recurrence of menstruation where fecundation had not taken place, and to assist in the retention and nutrition of the ovum when fecundated. He asserted that menstruation did not take place in the absence of the ovaries; that the menstrual flow occurred from the Fallopian tube as well as from the uterine mucous membrane. This was evident in the anatomical structure of the tube from the fact that blood was found in the tube in cases which have undergone operation during menstruation; that patients in whom fistulous tracts communicate with the tube have a bloody discharge during the menstrual flow. This view, however, has been combated and the occurrence of hydrosalpinx presented as evidence against it, the fluid here being perfectly clear, which, it is asserted, indicates that menstruation does not take place into the tube, but such cases are examples of diseased tubes in which the inflammatory changes have rendered the vessels more resistant and less likely to rupture. In his opinion many cases of hematosalpinx are the result of the retention of menstrual products.

Tubal Menstruation.—Dr. P. Brooke Bland read this paper by invitation, and said that this case was one of exceeding interest, not alone from the fact of its rarity and from the study of the part played by the tubal mucous membrane in the process of menstruation, but also the lesson it taught in the diagnosis of postoperative fistulæ following abdominal section. Ten months before presenting herself for examination the patient was operated upon for a large intrapelvic (probably broad ligament) abscess. She apparently made a complete recovery from this condition. Shortly after leaving the hospital, however, a small abdominal sinus developed almost simultaneously with the establishment of the succeeding menstrual flow, in the line of the old abdominal incision. On coming under the writer's observation ten months subsequent to her first operation, a small sinus was discovered in the lower half of the old abdominal scar. This readily admitted to a considerable depth an exploring probe. The material discharged from this opening was at times comparatively nil, but during, or, indeed, a day preceding the menstrual period, the discharge increased in quantity, became bloody and assumed all the characteristics of menstrual fluid. The patient was operated upon, and on entering the abdominal cavity, the fimbriated end of the right Fallopian tube was found adherent to the old abdominal cicatrix, and thus the behavior of the abnormal canal, particularly during the menstrual period, was explained. The author is persuaded from the phenomena manifested by this patient that during menstruation the tubal mucosa undergoes changes similar to the uterine mucosa,

though, perhaps, to a somewhat less degree, and thus confirms the observations of some of our most eminent investigators. He is further persuaded that if the function of menstruation is to prepare the endometrium for the implantation and development of the ovum, that the same changes, therefore, are essential to the implantation and development of a tubal or extra-uterine ovum or pregnancy. The practical deductions to be drawn from this case, according to the writer, are (1) that the tubal mucous membrane is an active participant in the process of menstruation; (2) that factors other than the presence of foreign bodies and infected ligatures must be considered in the causation of postoperative abdominal fistulæ; (3) that in the future consideration of the etiology of tubal gestation, the part played by the tubal mucosa during menstruation must be a factor for study. From a perusal of the literature he found but four similar cases recorded, one each by Hoffmeier, Lansdsberg, Serrillon and Thompson. For the privilege of reporting this case the writer acknowledges his gratefulness to Dr. E. E. Montgomery.

Dr. E. E. Montgomery, in the discussion, said that the device which Dr. Fisher had exhibited was certainly worthy of consideration and employment. He knew of nothing that gave him greater anxiety in the performance of an operation than the fear of leaving a piece of gauze in the abdominal cavity. He has not had the privilege of having this procedure introduced to him in St. Joseph's Hospital, and he congratulated Dr. Fisher upon having been so fortunate as to know of this very simple device, which can be employed with such ease, and which makes sure the removal of all the gauze from the abdomen.

Dr. A. J. Downes remarked that in the consideration of Dr. Stewart's paper the question occurred to him whether under similar circumstances the average surgeon would be justified in removing the uterus. Theoretically, it was altogether better to do this, because the inside of the uterus had the possibility of infection, in that the omentum had already been exposed to the air. At the same time, there are few surgeons, who, with a patient as low as this one, could have removed the uterus in twenty minutes. Under the circumstances, the average man would probably be doing better for the patient if he sewed up the rents, and pulled the omentum out through the vagina, after completing a good peritoneal toilet.

Dr. E. E. Montgomery said that the question has been raised regarding the advisability of doing hysterectomy in this case, and in similar ones. He is inclined to believe, from the description which Dr. Foltz gave of his case, of the patient's environment, etc., that hysterectomy was her salvation. Had anything less than that been done the patient would certainly have died from infection. By removal of the uterus, however, the infected structures were removed and the patient saved. He feels that the fact that this operation was done so skilfully and so quickly was due to the opportunities that Dr. Stewart had in his early career, and he is very proud of him.

Dr. Stewart, in closing the discussion, said that the pregnant uterus is large, easily held, and can be gotten out with less time and trouble than a large rent could be sewed. With the uterus as large as it is in pregnancy, with clots of blood and remains of placenta tissue and shreds, which are good culture media, he should think to remove all and leave the abdominal cavity clean, would be the safest course.

Dr. F. H. Maier said he wanted to congratulate Dr. Bland upon his paper, and upon the rare case which he found. Those cases which have been reported of blood coming from the end of the tubes, either through the abdomen or through the vagina, do not prove that the tubal mucosa takes any active bleeding part in the performance of menstruation. It has been known for a long time that hemorrhage from the mucous membrane of the tube does occur during menstruation; but these cases have invariably been ones in which either the tubes or the uterus have been pathologically altered, the alteration usually being inflammatory, a condition in which the structures are quite different from the normal. We know that in the one we have increased number of vessels with hyperemia, so that when the extra flux of menstruation occurs, the vessels are more liable to rupture, with consequent pouring out of blood into the tubes. The mere fact that the profession has so few hematosalpinges as compared with the large number of hydro- and pyosalpinges, is to his mind, evidence enough that it does not have, properly speaking, tubal menstruation. Fritsch and other men, who have removed uteri during menstruation, and who have examined the tubes carefully macroscopically and microscopically, demonstrated that at the most there may be increased secretion, and in some cases, a small number of red cells. There is also a weakness in the case reported by Dr. Bland, in so far that a sister died of uncontrollable epistaxis. Take the history of abnormal bleeding in the patient, together with a bleeder in the family, and the changes in the tubes, and you have ideal pathological conditions that would conduce to hemorrhage from the tubes. Up to the present time, there have been very few cases of tubal menstruation reported. In the case of Chapin-Minard, in which he actually saw blood coming from the uterine end of the tube in a case of inverted uterus, another pathological condition of the tube was had. In a case reported by Wendler, in which hysterectomy was done and the uterine end of the tube caught in the vaginal opening and allowed to remain, there occurred each month, simply an increase of mucous discharge without any hemorrhage. Up to the present time there have been extremely few cases in which blood has been found coming directly from the tube, and these cases undoubtedly have been ones in which there were pathological changes. In most of the cases reported by Bohn the tubes were removed for disease, for a myomatous condition of the uterus or for ovarian conditions.

Dr. Francis T. Stewart has operated upon two cases of ectopic pregnancy during the period of lactation. In one case in which the tube had ruptured, menstruation had not occurred between the time of labor and the time of rupture, eleven and a half months, so that in this case ovulation was not accompanied by menstruation. In the second case rupture occurred eight months after labor. There had been some bleeding from the uterus, which was probably due to the ectopic pregnancy rather than to menstruation. He simply mentions these two cases as bearing upon the relation of ovulation to menstruation.

Dr. Barnes would not cast any doubt upon the apparently strong evidence this case gives as to tubal menstruation, but asked a question simply to clear up a doubt in his own mind. Dr. Bland has stated that the probe passed readily through the old wound, probably into the uterus. It seemed to him in that case it was not improbable that the flow of blood may have been regurgitant blood from the uterus at the time of menstruation. That fact raised a grave doubt in his mind as to the validity of the proof that this case seems to give of tubal menstruation.

Dr. Montgomery, in closing the discussion, said that in regard to the objections which Dr. Maier presented to the possibility of tubal menstruation, and the fact that these cases were inflammatory, and that the latter was the cause of the hemorrhagic discharge from the tube, it is true that most of the cases coming under observation are diseased; but he is inclined to believe

that the inflammation of the tube associated with more or less hyperplasia in the majority of cases one sees the tendency would lead to a decrease of hemorrhage under the influence of blood pressure rather than increase. This is the reason hydrosalpinx or pyosalpinx are not found in the ordinary fluid discolored by blood. It is true that the tube cannot take an active part in the process of menstruation. When one comes to consider menstruation one knows that the discharge of blood is due to increased blood tension, so that the vessels rupture in that portion of the body in which they are the weakest. As the mucous membrane of the tube is similar in character to that of the uterus, except that it doesn't have the glandular structure, it is reasonable to suppose that in a healthy tube we would be likely to have rupture of the capillaries in the tube as in the uterine cavity. The profession well knows that the cervix doesn't take part in menstruation.

Dr. Bland, in closing, said in reply to Dr. Maier's objections relative to the tube undergoing changes when associated with ovarian neoplasms or fibroid tumors of the uterus, desired to state that he has found but very few tubes manifesting any gross change when removed with pathologically altered uteri or ovaries. They are, however, sometimes found. In regard to the question of regurgitation, this tube, in his judgment, was drawn to a higher level than it normally maintains, and, therefore, it would render regurgitation extremely difficult. Moreover, with the patient in the erect posture and the larger opening below, it is perfctly natural to suppose that the uterine menstrual flow would seek the most easy means of exit. He does not think this was an instance of backward regurgitation. He has also been privileged to inspect the internal genital organs of the woman during menstruation, but never examined them with a view to ascertain their true position in the menstrual process.

Exhibition of Specimens.—By Dr. A. J. Downes.—The patient was a woman, forty-eight years of age, with a history of bleeding for the last three years. Rapid abdominal examination revealed the presence of a very large mass. He operated upon her at once. He had not examined her per vaginam until just before the operation, while she was on the table. He thought she had a fibroid, and only then found that the body was fairly cystic. He still thought it was the uterus entirely, so he purse-stringed the cervix with a view of doing a complete hysterectomy. Through a very thin abdominal wall he found the cyst multilocular. It was removed by his electrothermic clamp. The uterus he found large and soft. He removed it with his electrothermic angiotribe, including the cervix. An explanation of the bleeding was found in the presence of two polypi within the uterus. There is a suspicious area, an excoriated surface that will require an examination for malignancy. This is the thirty-second hysterectomy he had done with his angiotribe, and he has practically done 12 others with other surgeons. This was the third hysterectomy to-day. He assisted another surgeon in the removal of two uteri, one a case of cancer, and one an exsanguinated patient who had been bleeding constantly for a number of years. The uterus of this bloodless patient was removed quickly by the surgeon with practically no loss of blood. He had about eight doctors present at his own operation, and no one thought there was a teaspoonful of blood lost. Almost anything can be done with sterile ligatures; the more he uses this method of performing hemostasis within the abdomen the more certain is he that it is far superior to ligatures. He can work more quickly to-day with it than when he was using ligatures two years ago. He has not used a ligature in any place for two years. He can report cases in the hands of other surgeons, such as removal of the shoulder-joint, with hemostasis of the axillary artery, and cases requiring hemostasis of the femoral artery. In hysterectomies the broad ligaments are hemostased and remain closed. A white ribbon is seen traveling down the lateral walls of the pelvis, and with good technic one need never suture the peritoneum at the lateral walls of the pelvis. The only sutures he uses are one or two at the cervix. The results seems to him to be better, and this is the opinion of other men using the instrument. There is less abdominal pain following hysterectomy with the use of this instrument than when ligatures are used. The Fallopian tube is always non-adherent after this method.

Exhibition of Three Specimens of Gonorrheal Pus Tubes.—Dr. George Erety Shoemaker exhibited three specimens of gonorrheal pus tubes. In each instance the patient made a good recovery. No drainage was employed. In one case the diagnosis of extra-uterine pregnancy could readily have been made from the symptoms of delayed period followed by very severe abdominal pain in paroxysms and bleeding from an empty uterus; while the lateral pelvic masses and blue discoloration of the vagina were suggestive.

BOOKS RECEIVED.

The MEDICAL NEWS *acknowledges the receipt of the following new publications. Reviews of those possessing special interest for the readers of the* MEDICAL NEWS *will shortly appear.*

A TEXT-BOOK ON THE PRACTICE OF MEDICINE. By Dr. Jas. M. French, 8vo, 780 pages. Illustrated. Wm. Wood & Co., New York.

A TEXT-BOOK OF PRACTICAL GYNECOLOGY. By Dr. Tod Gilliam. 8vo, 634 pages. Illustrated. F. A. Davis & Co., Philadelphia.

THE PRACTICE OF OBSTETRICS. By Dr. S. Clifton Edgar. 8vo, 1,111 pages. Illustrated. P. Blakiston's Son & Co., Philadelphia.

THE PRACTICE OF MEDICINE. By Dr. Jas. Tyson. Third edition. 8vo, 1,240 pages. Illustrated. P. Blakiston's Son & Co., Philadelphia.

PRACTICAL GYNECOLOGY. By Dr. E. E. Montgomery. Second edition. 8vo, 900 pages. Illustrated. P. Blakiston's Son & Co., Philadelphia.

TREATISE ON ORTHOPEDIC SURGERY. By Dr. Royal Whitman. Second edition. 8vo, 848 pages. Illustrated. Lea Brothers & Co., Philadelphia and New York.

A MANUAL OF HYGIENE AND SANITATION. By Dr. Seneca Egbert. Third edition. 8vo, 473 pages. Illustrated. Lea Brothers & Co., Philadelphia and New York.

GENERAL PATHOLOGY. By Dr. E. Ziegler. Translated and tenth revised German edition by Dr. A. S. Warthin. 8vo, 760 pages. Illustrated. Wm. Wood & Co., New York.

GRUNDRISS DER AUGENHEILKUNDE. By Dr. Chas. H. May. Authorized German edition, translated by Dr. E. H. Oppenheimer. 8vo, 344 pages. Illustrated. A Hirschwald, Berlin.

ANATOMY. A MANUAL FOR STUDENTS AND PRACTITIONERS. By Dr. H. E. Hall. Edited by V. C. Pedersen. Demi 8vo, 389 pages. Illustrated. Lea Brothers & Co., Philadelphia and New York.

A MANUAL OF ELECTROSTATIC MODES OF APPLICATION, THERAPEUTICS, RADIOGRAPHY AND RADIOTHERAPY. By Dr. W. B. Snow. Second edition. 8vo, 302 pages. Illustrated. A. L. Chatterton & Co., New York.